

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

REPORT
OF THE
DOMINION EXPERIMENTAL
FARMS

FOR THE
FISCAL YEAR ENDING MARCH 31, 1920

PRINTED BY ORDER OF PARLIAMENT.



OTTAWA
THOMAS MULVEY
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1921

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

REPORT

OF THE

DOMINION EXPERIMENTAL FARMS

FOR THE

FISCAL YEAR ENDING MARCH 31, 1920

PRINTED BY ORDER OF PARLIAMENT



OTTAWA

THOMAS MURPHY

PRINTED TO THE ORDER OF THE MINISTER OF AGRICULTURE

1920

131-10-1920

OTTAWA, March 31, 1920.

The Honourable

The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to submit herewith, for your approval, the thirty-third annual report of the work carried on by the Experimental Farms Branch of the Department of Agriculture, during the year ending March 31, 1920.

This report is merely a summary of the year's operations but an endeavour has been made to prepare it in such a way that it will be found both readable and giving a very fair general idea of the lines of activity pursued.

I have the honour to be, sir,

Your obedient servant,

E. S. ARCHIBALD,

Director, Dominion Experimental Farms.

TABLE OF CONTENTS

	PAGE.
Director's Report—E. S. Archibald, B.A., B.S.A.,—including general notes and synopsis of the work on the Sub-Stations..	5- 15
Animal Husbandman—Report of the Acting Dominion..	16- 22
Field Husbandman—Report of the Assistant Dominion..	22- 24
Horticulturist—Report of the Dominion..	25- 29
Poultry Husbandman—Report of the Dominion..	29- 36
Tobacco Husbandman—Report of the..	37- 41
Apiarist—Report of the..	41- 42
Economic Fibre Specialist—Report of the..	42- 43
Chemist—Report of the Dominion..	43- 58
Botanist—Report of the Acting Dominion..	58- 64
Cerealist—Report of the Dominion..	64- 66
Agrostologist—Report of the Dominion..	67- 70
Supervisor, Illustration Stations—Report of the..	70- 83
Extension and Publicity—Report of the officer in charge..	83- 85
Charlottetown, P.E.I.—Report of the Superintendent at..	85- 91
Kentville, N.S.—Report of the Superintendent at..	91-101
Nappan, N.S.—Report of the Superintendent at..	101-108
Fredericton, N.B.—Report of the Superintendent at..	108-113
Ste. Anne de la Pocatière, Que.—Report of the Superintendent at..	114-116
Cap Rouge, Que.—Report of the Superintendent at..	117-130
Lennoxville, Que.—Report of the Superintendent at..	130-137
La Ferme, Que.—Report of the Foreman-Manager at..	138-139
Kapuskasing, Ont.—Report of the Foreman-Manager at..	139-142
Morden, Man.—Report of the Superintendent at..	143-152
Brandon, Man.—Report of the Superintendent at..	152-156
Indian Head, Sask.—Report of the Superintendent at..	156-159
Rosthern, Sask.—Report of the Superintendent at..	160-163
Scott, Sask.—Report of the Superintendent at..	163-166
Lethbridge, Alta.—Report of the Superintendent at..	166-170
Lacombe, Alta.—Report of the Asst. to the Superintendent at..	170-175
Summerland, B.C.—Report of the Superintendent at..	175-178
Invermere, B.C.—Report of the Acting Superintendent at..	178-187
Agassiz, B.C.—Report of the Officer in Charge at..	187-193
Sidney, B.C.—Report of the Superintendent at..	193-198

ANNUAL REPORT OF THE EXPERIMENTAL FARMS

FOR THE YEAR ENDING MARCH 31, 1920

REPORT OF THE DIRECTOR

E. S. Archibald, B.A., B.S.A.

FIELD CROP AND LIVE STOCK NOTES FOR 1919

The season opened tardily and practically no seeding had been done in the Maritime Provinces and Quebec at the end of April. In Ontario very little had been done as heavy snowfalls during the last week of April had left the land too wet for tilling. In the western provinces, although the spring opened late, about 60 per cent of seeding was completed by May 1. At the end of June, the condition of the principal grain crops indicated that for the fourth successive year the yields of the Dominion would be below the average of the previous ten years.

In Manitoba and Ontario warm rains and generally favourable weather gave promise of a good harvest. In the Maritime Provinces and Quebec, the conditions also were generally favourable and the harvest was good.

The results of harvesting of grain crops in Alberta and Saskatchewan showed poor to very poor yields in the southern parts of those provinces, and poor to good in the northern districts.

The area sown to wheat was 19,125,968 acres, as compared with 17,353,902 in 1918. The total value of Canada's field crops for the year was \$1,452,437,500, as compared with the total value of \$1,367,909,970 in 1918.

The area under roots and fodder crops amounted to 12,554,974 acres, as compared with 12,321,351 acres in 1918. The total estimated yield of potatoes for 1919 was 125,574,900 bushels, being much greater than the yield of 1918.

In the following tables, details are given of the yields and values of the principal field crops for 1918 and 1919. In table 3 the numbers of the various classes of live stock in Canada are given for the period of 1915-1919.

11 GEORGE V, A. 1921

TABLE I.—COMPARISON OF YIELDS AND PRICES OBTAINED FOR THE YEARS 1918 AND 1919

Crop	Average Yield per acre.		Average Price per bush.		Total Yield.	
	1918	1919	1918	1919	1918	1919
	bush.	bush.	\$	\$	bush.	bush.
Fall wheat.....	19.00	23.75	2 08	1 97	7,942,800	16,006,000
Spring wheat.....	10.75	9.50	2 02	1 88	181,132,550	177,254,400
All wheat.....	11.00	10.00	2 02	1 89	189,075,350	193,260,400
Oats.....	28.75	26.25	0 78	0 80	426,312,500	394,387,000
Barley.....	24.50	21.25	1 00	1 37	77,287,240	56,389,400
Rye.....	15.25	13.50	1 49	1 40	8,504,400	10,207,400
Peas.....	13.25	14.75	2 54	2 86	3,099,400	3,406,300
Beans.....	15.50	16.50	5 41	4 48	3,563,380	1,288,600
Buckwheat.....	20.75	23.50	1 58	1 50	11,375,500	10,550,800
Mixed grains.....	38.75	31.00	1 14	1 36	35,662,300	27,851,700
Flax.....	5.75	5.00	3 13	4 13	6,055,200	5,472,800
Corn for husking.....	56.75	64.20	1 75	1 30	14,214,200	16,940,500
Potatoes.....	142.00	153.50	0 98	0 95	104,364,200	125,574,900
Turnips, mangels, etc.....	377.50	354.00	0 43	0 50	122,699,600	112,288,600
Hay and clover.....	tons 1.40	tons 1.55	per ton 16 25	per ton 20 72	tons 14,772,300	tons 16,348,000
Fodder corn.....	9.50	9.75	6 15	6 92	4,787,500	4,942,760
Sugar beets.....	10.00	9.80	10 25	10 86	180,000	240,000
Alfalfa.....	2.25	2.20	17 84	21 85	446,400	494,200

TABLE 2.—COMPARISON OF EASTERN CANADA, PRAIRIE PROVINCES AND BRITISH COLUMBIA AS TO YIELDS AND PRICES OBTAINED

Crop	Eastern Provinces				Prairie Provinces				British Columbia			
	Average Yield per acre		Average Price obtained		Average Yield per acre		Average Price obtained		Average Yield per acre		Average Price obtained.	
	1918	1919	1918	1919	1918	1919	1918	1919	1918	1919	1918	1919
Fall wheat.....	bush. 19.50	bush. 24.30	\$ 2 09	\$ 1 97	bush. 15.17	bush. 15.75	\$ 1 93	\$ 1 98	bush. 24.75	bush. 24.75	\$ 2 15	\$ 2 40
Spring wheat.....	20.21	16.37	2 16	2 18	10.18	9.31	2 28	1 86	22.00	22.00	2 08	2 31
Oats.....	37.58	28.75	0 84	0 97	23.73	24.92	0 71	0 68	39.75	47.25	1 00	1 07
Barley.....	33.74	23.21	1 26	1 41	20.95	20.31	0 90	1 35	26.50	33.00	1 47	1 82
Peas.....	12.89	14.61	2 57	2 85	19.38	16.31	1 50	3 07	21.50	23.00	3 00	2 60
Rye.....	16.11	16.20	1 66	1 59	15.01	12.67	1 43	1 31	30.00	22.50	2 07	2 08
Flax.....	11.99	9.58	3 51	3 67	5.53	4.90	3 11	4 15	.....	.....	.....	.....
Potatoes.....	144.49	151.12	1 02	0 97	123.43	160.88	0 80	0 85	228.00	170.00	0 97	1 00
Turnips, etc.....	399.33	368.09	0 48	0 44	219.28	230.95	0 66	1 02	422.00	365.00	0 60	0 75
Hay and clover.....	tons. 1.43	tons 1.57	16 19	20 70	tons 0.97	tons 1.21	14 14	18 60	tons 1.90	tons 1.50	33 25	35 25
Sugar beets.....	10.00	9.79	10 25	10 86	.....	.....	.....	.....	.....	.....	.....	.....
Fodder corn.....	9.73	9.71	6 01	6 60	5.57	8.32	10 50	12 89	10.10	11.50	10 00	12 00
Alfalfa.....	2.28	2.18	15 63	19 15	1.91	1.90	20 49	27 69	3.25	3.00	32 25	37 00

SESSIONAL PAPER No. 16

TABLE 3.—FARM AND LIVE STOCK, 1915-1919

Live Stock	1915	1916	1917	1918	1919
Eastern Provinces—					
Horses.....	1,442,063	1,396,760	1,434,832	1,399,099	1,365,464
Milch cows.....	2,075,750	1,998,318	2,270,837	2,585,285	2,558,313
Other cattle.....	1,848,504	1,727,773	2,103,329	3,501,640	3,535,082
Sheep.....	1,569,488	1,483,065	1,840,054	2,404,319	2,698,394
Swine.....	2,269,029	2,096,832	2,102,506	2,842,507	2,855,343
Western Provinces—					
Horses.....	1,492,681	1,800,270	1,922,793	2,166,027	2,258,188
Milch cows.....	553,152	792,797	882,441	907,350	938,530
Other cattle.....	1,450,212	1,929,844	2,423,990	2,810,462	2,806,848
Sheep.....	420,770	493,607	485,446	603,138	678,579
Swine.....	804,328	1,340,179	1,479,188	1,407,370	1,139,767
British Columbia—					
Horses.....	61,355	61,312	55,124	44,131	43,717
Milch cows.....	37,944	39,318	49,005	50,965	51,594
Other cattle.....	100,439	103,101	191,338	195,165	194,644
Sheep.....	46,404	46,269	43,858	45,291	44,985
Swine.....	38,543	37,829	37,688	39,805	44,960

TABLE OF METEOROLOGICAL OBSERVATIONS TAKEN AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, FROM APRIL 1, 1919, TO MARCH 31, 1920; GIVING MAXIMUM, MINIMUM, AND MEAN TEMPERATURE FOR EACH MONTH WITH DATE OF OCCURRENCE, ALSO THE RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION

Months	Maximum	Minimum	Range	Mean	Highest	Date	Lowest	Date	Rainfall	Snowfall	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours	Date
	°	°	°	°	°		°		In.	In.	In.		In.	
April.....	47.36	30.00	17.36	38.68	69.0	23	3.0	1	2.83	4.50	3.28	15	0.50	16
May.....	65.13	45.49	19.64	55.31	84.0	29	32.0	6	3.77	.....	3.77	18	0.82	21
June.....	82.68	59.56	23.11	71.11	96.0	3	44.0	28	2.36	.....	2.36	8	0.82	26
July.....	84.50	59.43	25.07	71.96	99.0	4	50.0	8	1.59	.....	1.59	9	0.34	10
August.....	77.28	55.78	21.50	66.53	91.6	7	41.9	9	1.41	.....	1.41	14	0.32	21
September...	68.97	48.28	20.68	58.62	83.8	21	35.0	27	2.48	.....	2.48	16	0.57	9
October.....	54.10	37.34	16.75	45.71	75.0	10	25.0	8	4.91	.....	4.91	17	1.81	31
November...	37.47	25.14	12.32	31.30	58.0	11	4.4	28	2.19	5.25	2.71	17	0.53	5
December...	23.14	5.67	17.46	14.40	44.0	13	-16.6	18	0.12	9.25	1.04	14	0.32	24
January.....	11.89	-8.13	20.02	1.88	33.8	8	-29.0	19	.....	30.00	2.99	12	0.90	17
February....	22.21	3.01	19.19	12.60	33.0	7	-25.0	1	.....	22.00	2.20	11	0.80	15
March.....	37.75	18.97	18.78	28.36	63.6	24	-16.4	2	1.42	9.75	2.39	15	0.55	5
									23.08	80.75	31.13	166		

Rain or snow fell on 166 days during the 12 months.

Heaviest rainfall in 24 hours, 1.81 inches on October 31.

Heaviest snowfall in 24 hours, 9.00 inches on January 17.

The highest temperature during the 12 months was 99° 0' on July 4.

The lowest temperature during the 12 months was -29° 0' on January 19.

During the growing season rain fell on 15 days in April, 18 days in May, 8 days in June, 9 days in July, 14 days in August, and 16 days in September.

June shows the lowest number of days with precipitation, viz. 8.

Total precipitation during the 12 months 31.13 inches, as compared with 37.94 inches during 1918-19.

11 GEORGE V, A. 1921

RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION FROM 1890 TO 1919-20, ALSO THE AVERAGE ANNUAL AMOUNT THAT HAS FALLEN

Years	Rainfall	Snowfall	Total Precipitation
1890.....	24.73	64.85	31.22
1891.....	30.19	73.50	37.54
1892.....	23.78	105.00	34.28
1893.....	31.79	72.50	39.04
1894.....	23.05	71.50	30.20
1895.....	27.01	87.50	35.76
1896.....	21.53	99.75	31.50
1897.....	24.18	89.00	33.08
1898.....	24.75	112.25	35.97
1899.....	33.86	77.25	41.63
1900.....	29.48	108.00	40.72
1901.....	29.21	97.25	38.91
1902.....	25.94	101.75	36.10
1903.....	26.43	85.00	34.92
1904.....	25.95	108.75	36.79
1905.....	23.71	87.25	32.42
1906—January 1, to March 31.....	1.90	24.50	4.34
1906-07.....	21.73	72.50	28.94
1907-08.....	24.70	134.75	38.18
1908-09.....	22.13	107.90	32.91
1909-10.....	28.40	61.25	34.51
1910-11.....	18.94	88.25	27.72
1911-12.....	20.12	98.50	29.95
1912-13.....	32.54	106.50	43.18
1913-14.....	21.51	70.25	28.51
1914-15.....	16.77	78.50	24.67
1915-16.....	22.66	130.00	35.65
1916-17.....	24.84	126.50	37.18
1917-18.....	20.90	116.00	32.48
1918-19.....	29.23	87.25	37.94
1919-20.....	23.08	80.75	31.13
Total for 30 years and 3 months.....	755.04	2,824.50	1,037.37
Average for 30 years.....	25.16	94.15	34.57

RECORD OF SUNSHINE AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, FROM APRIL 1, 1919, TO MARCH 31, 1920

Months	Number of days with Sunshine	Number of days without Sunshine	Total hours Sunshine	Average Sunshine per day
April.....	21	9	156.0	5.20
May.....	27	4	210.3	6.78
June.....	29	1	303.5	10.11
July.....	30	1	321.5	10.37
August.....	29	2	210.9	6.80
September.....	29	1	181.5	6.05
October.....	23	8	125.8	4.05
November.....	21	9	49.7	1.65
December.....	23	8	103.2	3.32
January.....	23	8	111.2	3.58
February.....	24	5	131.3	4.52
March.....	29	2	160.9	5.19

(Signed) WILLIAM T. ELLIS,
Observer.

SESSIONAL PAPER No. 16

DISTRIBUTION OF SAMPLES

The distribution of samples of seed grain, potatoes, flower-seeds, fruit trees and shrubs was again carried on during the past winter from the Central Farm at Ottawa and from the various branch Farms and Stations. The distribution of seed grain was made from Ottawa and of seed grain and potatoes from the branch Farms and Stations.

EXPERIMENTS AT FORT VERMILION, ALTA.

CHARACTER OF SEASON

A number of snowstorms occurred in April and cold weather continued until late in the month. Wheat was sown on April 28. May was moderately cold. June was cold up to the 11th, on which date was experienced the last spring frost. Frost on June 3 killed back some of the more tender varieties of vegetables and flowers. After June 11 the weather became warm and remained so during the balance of the growing season. Abundance of rain fell and crops made rapid growth. The first wheat was cut on August 16 and the last plot was cut on September 6. Marquis and Red Fife wheats, which had not been cut until after a severe frost on September 3, showed the effects of this frost. Due to showery weather at the end of August and the beginning of September great difficulty was experienced in getting the grain threshed. October was very unfavourable for fall work and only a small amount of ploughing was done. On the 26th the temperature went as low as 22 degrees below zero. November was quite cold with considerable snow.

CEREALS

Seven varieties of spring wheat were tested. The length of straw varied from 49 to 61 inches. Huron gave the highest yield of 57 bushels per acre and Ruby the lowest, 48 bushels. Seven varieties of oats were grown. Garton's Regenerated Abundance gave 62 bushels 32 pounds, Banner 54 bushels 24 pounds and Liberty (hulless) 30 bushels per acre. Of the five varieties of barley tested the highest yield was obtained from Manchurian, a six-rowed sort, which gave 62 bushels and 24 pounds. Canadian Thorpe, a two-rowed sort, gave a yield of 52 bushels 24 pounds. Yields of flax seed were small due to the setback which the plants received by the frost on June 3. The yield of hemp was large due to abundance of rain during the growing season. Buckwheat gave practically no yield of seed on account of the damage received by severe frost on September 3. Spring frosts, difficulty in threshing and mice caused losses in yields of field peas. Arthur gave 34 bushels and Prussian Blue 32 bushels per acre. Spring rye yielded at the rate of 50 bushels 20 pounds and winter rye 54 bushels and 36 pounds per acre.

FORAGE CROPS

Due to the abundance of rain alfalfa and clovers made rank growth. Excellent yields were recorded from variegated and common alfalfa and from red and alsike clover. Considerable difficulty was caused by rains in the harvesting of clovers and alfalfa. Red Top and Orchard grass were both killed in the winter of 1918-19. All other grasses made good growth this season, but due to heavy rains the hay was of inferior quality. Seed of fair quality was gathered from the plot of timothy. The following are some of the yields per acre recorded: Alfalfa variegated, first cutting, 3 tons, 450 pounds, second cutting, 1 ton, 1,450 pounds; alfalfa common, first cutting, 3 tons, 600 pounds, second cutting, 1 ton, 700 pounds; red clover, 2 tons, 1,550 pounds; alsike, 3 tons, 150 pounds; awnless brome grass, 3 tons, 950 pounds; western rye grass, 4 tons, 550 pounds; timothy, 2 tons, 1,100 pounds; meadow fescue, 3 tons, 500 pounds. Canary seed grass gave a yield of 5 tons, 800 pounds of very rough hay. The plot of rape made the usual good growth.

Germination of root seed was slow due to coldness of land in May. Growth was slow until past the middle of June when the weather warmed up. During the balance of the season roots made favourable growth and when harvested were of a fair size and

yields were quite satisfactory. Some of the largest yields of roots per acre were obtained with the following varieties:—

Mangels.—Giant Yellow Intermediate, 19 tons, 100 pounds; Giant Yellow Globe, 19 tons, 400 pounds; Selected Yellow Globe, 18 tons 1,380 pounds.

Carrots.—Chantenay, 20 tons, 200 pounds; Half Long Chantenay, 18 tons, 1,900 pounds; White Belgian, 18 tons, 600 pounds.

Swede Turnips.—White Globe, 25 tons, 1,600 pounds; Good Luck, 22 tons, 1,570 pounds; Perfection Swede, 21 tons, 600 pounds.

Sugar Beets.—Wohanka (British Columbia grown seed) 14 tons, 1,580 pounds; Waterloo (Chatham grown seed), 13 tons, 100 pounds.

Heavy frost on June 3 cut all the millet plants down to the ground and as the nights following were cold with more frosts, the plants were almost completely killed and no yields were obtained.

The corn also suffered greatly from this frost on June 3. Some of the highest yields obtained per acre are as follows: White Sweet Squaw, 14 tons, 1,040 pounds; Extra Early Cory, 13 tons, 1,900 pounds; Yellow Field, 13 tons, 400 pounds; Mixture of field varieties, 13 tons, 1,960 pounds.

HORTICULTURE

The season of 1919 was quite favourable for horticultural work. Heavy frost on June 3 killed some more tender varieties of vegetables and flowers. Abundance of moisture fell in the growing season and all vegetables made rapid growth and when harvested in most cases quite large yields were recorded. Potatoes were a very heavy crop. Twenty-three different vegetable crops and several varieties of each crop were grown. The annual flower garden was well up to the average but a little later than usual coming into bloom, due to unfavourable weather conditions. Through the latter part of July and August and well into September the showing was unusually fine. The asters are especially worthy of mention. The sweet peas although a little late gave a fine display of bloom which lasted up to the severe frost on September 28. The rose bushes succeeded very well. They gave a very creditable amount of bloom during the past season and were still in bloom when cut down by frost on September 28. Perennial flowers came into bloom much earlier than any of the annuals and produced an abundance of bloom throughout the past season.

TABLE OF METEOROLOGICAL OBSERVATIONS TAKEN AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA, FROM APRIL 1, 1919, TO MARCH 31, 1920, SHOWING MAXIMUM, MINIMUM, AND MEAN TEMPERATURE, THE HIGHEST AND LOWEST FOR EACH MONTH WITH DATE OF OCCURRENCE, ALSO RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION

Months	Maximum	Minimum	Range	Mean	Highest	Date	Lowest	Date	Rainfall	Snowfall	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours	Date
	°	°	°	°	°		°		In.	In.	In.		In.	
April.....	49.63	18.63	31.00	34.13	69.9	27	10.2	22	0.69	3.00	0.99	2	0.69	20
May.....	57.82	27.89	29.93	42.85	76.0	19	13.5	5	0.74	3.25	1.06	7	0.39	23
June.....	63.44	36.26	27.18	49.81	89.2	15	20.0	1	6.76	.....	6.76	11	1.30	6
July.....	73.06	44.23	28.82	58.64	89.0	16	34.0	3	1.92	.....	1.92	9	0.63	6
August.....	70.77	41.98	28.79	56.37	82.5	13	28.5	25 & 31	2.79	.....	2.79	13	1.74	5
September...	63.93	28.93	35.00	46.43	82.0	18	14.0	28	0.81	.....	0.81	3	0.56	25
October.....	32.51	4.77	27.73	18.63	58.9	4	-22.0	26	0.62	6.00	1.26	7	0.40	7
November...	13.55	-13.89	27.44	-0.17	42.0	21	-46.9	30	.....	5.25	0.52	3	0.40	9
December...	4.32	-22.36	26.65	-9.04	49.0	19	-50.0	15	.....	1.75	0.17	2	0.12	16
January.....	-3.80	-31.77	27.97	-17.79	26.0	6	-58.9	24	.....	2.50	0.25	1	0.25	15
February....	23.46	-11.20	34.66	6.13	46.0	18	-41.0	2	.....	1.50	0.15	3	0.05	9
March.....	23.50	-12.89	36.40	5.31	42.5	13	-47.0	2	.....	1.50	0.15	3	0.05	20
									14.33	24.75	16.83	64		

SESSIONAL PAPER No. 16

SOME WEATHER OBSERVATIONS TAKEN AT CENTRAL EXPERIMENTAL FARM, OTTAWA, AS COMPARED WITH THOSE TAKEN AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

	Mean Tem- perature	Highest Tem- perature	Lowest tem- perature	Total Pre-ci- pitation	Heaviest in 24 hours	Total hours Sunshine	Average Sunshine per day
<i>April</i>	°	°	°	In.	In.	Hr.	Hr.
Ottawa.....	38.68	69.0	3.0	3.28	0.50	156.0	5.20
Fort Vermilion.....	34.13	69.9	10.2	0.99	0.69	186.9	6.23
<i>May</i>							
Ottawa.....	55.31	84.0	32.0	3.77	0.82	210.3	6.78
Fort Vermilion.....	42.85	76.0	13.5	1.06	0.39	174.2	5.61
<i>June</i>							
Ottawa.....	71.11	96.0	44.0	2.36	0.82	303.5	10.11
Fort Vermilion.....	49.85	89.2	20.0	6.76	1.30	206.9	6.89
<i>July</i>							
Ottawa.....	71.96	99.0	50.0	1.59	0.34	321.5	10.37
Fort Vermilion.....	58.64	89.0	34.0	1.92	0.63	279.8	9.02
<i>August</i>							
Ottawa.....	66.53	91.6	41.9	1.41	0.32	210.9	6.80
Fort Vermilion.....	56.37	82.5	28.5	2.79	1.74	255.0	8.22
<i>September</i>							
Ottawa.....	58.62	83.8	35.0	2.48	0.57	181.5	6.05
Fort Vermilion.....	46.43	82.0	14.0	0.81	0.56	225.6	7.55
<i>October</i>							
Ottawa.....	45.71	75.0	25.0	4.91	1.81	125.8	4.05
Fort Vermilion.....	18.63	58.9	-22.0	1.26	0.40	97.3	3.13
<i>November</i>							
Ottawa.....	31.30	58.0	4.4	2.71	0.53	49.7	1.65
Fort Vermilion.....	-0.17	42.0	-46.9	0.52	0.40	73.9	2.46
<i>December</i>							
Ottawa.....	14.40	44.0	-16.6	1.04	0.32	103.2	3.32
Fort Vermilion.....	-9.04	49.0	-50.0	0.17	0.12	59.4	1.91
<i>January</i>							
Ottawa.....	1.88	33.8	-29.0	2.99	0.90	111.2	3.58
Fort Vermilion.....	-17.79	26.0	-58.9	0.25	0.25	84.3	2.71
<i>February</i>							
Ottawa.....	12.60	33.0	-25.0	2.20	0.80	131.3	4.52
Fort Vermilion.....	6.13	46.0	-41.0	0.15	0.05	121.6	4.19
<i>March</i>							
Ottawa.....	28.36	63.6	-16.4	2.39	0.55	160.9	5.19
Fort Vermilion.....	5.31	42.5	-47.0	0.15	0.05	166.0	5.35

11 GEORGE V, A. 1921

RECORD OF SUNSHINE AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA, FROM APRIL 1, 1919, TO MARCH 31, 1920.

Months	Number of days with sunshine	Number of days without sunshine	Total hours sunshine	Average sunshine per day
April.....	27	3	186.9	6.23
May.....	23	8	174.2	5.61
June.....	21	9	206.9	6.89
July....	28	3	279.8	9.02
August..	29	2	255.0	8.22
September.....	28	2	225.6	7.52
October.....	19	12	97.3	3.13
November .	18	12	73.9	2.46
December.....	21	10	59.4	1.91
January.....	22	9	84.3	2.71
February....	25	4	121.6	4.19
March.....	25	6	166.0	5.35

EXPERIMENTS AT GROUARD, ALTA.

Character of the season.—The fall of 1918 was exceedingly dry, preventing satisfactory ploughing. For this reason it was decided to sow in land previously in potatoes, which proved a success. In the spring, the weather was cold for a long time, causing a delay of at least fifteen days in the season. The cold weather was followed by incessant rains and very little warm weather, which retarded maturity.

Cereals.—Four varieties of spring wheat were tested. Prelude, Huron and Marquis yielded, respectively, 32, 46 and 51 bushels per acre. Ruby, a new variety, seemingly the best suited to the region, yielded 49 bushels per acre.

The barley test gave the following results: O.A.C. No. 21, 71½ bushels per acre; inclined to lodge. Duckbill, 70 bushels; stiff straw. Albert, 52 bushels; early; inclined to lodge.

A comparison of three varieties of oats showed that, although not the earliest, Victory, with a yield of 148 bushels per acre, is more advantageous than Banner or Daubeney, with 145 and 98 bushels per acre respectively.

One-half pound of fall rye seed, not completely dry, was sown in October, 1918, and yielded 33 pounds.

Horticulture.—Many farmers expecting a long fall were deceived and a large quantity of potatoes and vegetables were left in the ground and grain in stock owing to the sudden setting in of winter.

Although better success has been obtained in the past, our garden crops have been, as usual, remarkable. Cabbage, cauliflower, Brussels sprouts, celery, kohlrabi and tomatoes, sown in hotbeds, all gave good crops except tomatoes, which had to be used green. Of the vegetables sown directly in the open, beans were either frozen or failed to ripen, cucumbers were a failure, and salsify unsatisfactory. Beets, carrots, turnips, onions, parsley, parsnip, peas, radish and spinach gave excellent crops. Pumpkins and squash weighing 10 to 12 pounds were obtained, and also a few citrons, one weighing 1 pound. Squaw corn proved hardier and earlier than Early Sweet Malcolm and gave several ripe well filled ears, but the season generally was unfavourable. Turnips were injured by rust.

All the old varieties of fruit trees, single and improved Siberian apple trees have perished or are dying, and there is no chance of saving them.

SESSIONAL PAPER No. 16

Currants, young and old, continue to give fine results. It is one of the best fruits for the region, as it always succeeds when pruned and sprayed with Paris green.

Purple and white lilacs are always in good condition, they are easily multiplied and highly decorative.

EXPERIMENTS AT BEAVERLODGE, ALTA.

Early disappearance of snow in the spring of 1919 was followed by a prolonged period of cold, dry, windy weather with some hard frosts during May and June. New meadows made very slow growth and old meadows were almost failures. Insufficient moisture, amounting to only 4.16 inches from the first of May to the middle of July, retarded the growth of all crops. Wheat plots were seeded April 17 under favourable conditions but the weather following was not conducive to high yields. Rain fell in abundance in the latter part of the growing season and although the lowering of the temperature to 29.5 degrees Fahr. on the morning of September 1 affected the grade of wheat and the germination of oats, the yields of the late-maturing varieties were good. The first hard killing frost occurred on September 27.

Six varieties of spring wheat were grown. Huron gave the highest yield of 46 bushels and 17 pounds. Marquis was second in yield, with 46 bushels and 15 pounds per acre. Ruby yielded well, but considerable loss resulted from shelling by the wind. Grande Prairie district as a whole is better suited for the production of oats than wheat or barley. Of the six varieties of oats tested this year Banner yielded 132 bushels 32 pounds, Victory 119 bushels 24 pounds and Liberty (hulless) 72 bushels 2 pounds. The last variety is very well suited to this district on account of its earliness, strength of straw and good yielding qualities. O.A.C. No. 21 barley gave the highest yield of the varieties of barley tested. The two-rowed Early Chevalier excels the six-rowed sorts in its ability to withstand the heavy winds. O.A.C. No. 21 yielded per acre 55 bushels 40 pounds, Guymalaye, a hulless variety, gave 49 bushels 8 pounds per acre. Other varieties tested gave smaller yields. The average yield of three plots of peas was 23 bushels 23 pounds per acre. Winter rye gave a yield per acre of 43 bushels 22 pounds and Turkey Red winter wheat produced 36 bushels per acre.

The following experiments were conducted with forage crops in the past season. The nurse crop experiment; grass and clover mixture experiment; special alfalfa experiments; tests with field roots, annual hay, pasture and ensilage crops; inoculation tests with legumes; thickness of seeding tests with timothy and western rye grass; grasses and clovers for seed production; three years' stand of timothy and western rye grass. Combining the sowings of 1918 and 1919, over five hundred plots of forage crops are under test at Beaverlodge. Special effort is being made to ascertain what grasses and clovers will succeed here. Of ten hay crops tried, western rye grass and timothy appear to be the most suitable, with sweet clover holding some promise for the provision of midsummer pasture. A mixture of red and alsike clovers seems to be the most likely clover basis for mixed seedings with a view to hay production. It appears at present that the most satisfactory rotation may prove to be the one in which hay crops are seeded during the latter half of May with a thin-sown crop of either barley or oats for green feed. Results from root crops have not been very encouraging. Turnips are the safest of these crops. Millet is not sufficiently hardy to be dependable. Corn for fodder is not hopeful but sunflowers promise to be hardy and productive. On frosty areas the production of rye grass and timothy seed promises to be a safe and more profitable line of production than the raising of grain. Red clover and alsike ripened seed on several occasions but no alfalfa seed has been produced.

A date-of-seeding experiment commenced in 1918 was continued this year with wheat, oats, barley, flax and peas and considerable valuable data were collected.

11 GEORGE V, A. 1921

No season for six years has been as unfavourable for vegetable gardening as the season of 1919. Cold dry weather until midsummer, frosts, lashing winds and insects destroyed many vegetable plots. Potatoes, however, made a first-class stand and peas where not planted too shallow produced good rows and during the latter part of the summer bore long and abundantly. Everything that got a good start attained a fine development in the end, but so many seedlings were destroyed or made a late weak start that the rows of winter vegetables were nearly all ragged and thin and a majority of the specimens small. The freeze-up commencing October 8 destroyed many potatoes and other vegetables in the ground or seriously affected their eating and keeping qualities. The highest yielding varieties of potatoes produced at the following rates per acre: American Wonder, 484 bushels 30 pounds; Early Northern, 476 bushels; Gold Coin, 408 bushels. Several cultural tests are being conducted with potatoes, with fairly good results. A considerable number of flowers can be grown successfully in this district. Of the perennial flowers, pansies, larkspurs, Iceland and California poppies gave good results. Sweet peas, nasturtiums, climbing nasturtiums, marigolds, linaria and asters also produced a fine display of bloom. Chinese lilacs, Caragana, Manitoba maple, wild honeysuckle and two varieties of spiræa are proving fairly hardy. Several varieties of black, red and white currants gave excellent yields in the past season. The outlook for currants, raspberries, strawberries and gooseberries is very hopeful. The apples planted out are nearly all alive but the trees killed back badly in the winter of 1918-19.

TABLE OF METEOROLOGICAL OBSERVATIONS TAKEN AT BEAVERLODGE, GRANDE PRAIRIE, ALBERTA, FROM APRIL 1, 1919, TO MARCH 31, 1920, GIVING THE MAXIMUM, MINIMUM, AND MEAN TEMPERATURE FOR EACH MONTH, ALSO RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION.

Months	Maximum	Minimum	Range	Mean	Highest	Date	Lowest	Date	Rainfall	Snowfall	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours	Date
	°	°	°	°	°		°		In.		In.		In.	
April.....	51.36	30.23	21.13	40.79	70.0	26	24.0	22	0.42	4.00	0.82	3	0.40	4
May.....	56.62	33.40	23.20	45.01	75.0	18	17.5	5	1.04	.....	1.04	5	0.87	30
June.....	62.46	39.63	22.83	51.04	83.0	19	24.0	1	2.48	.....	2.48	11	0.67	5
July.....	70.58	45.96	24.61	58.26	86.0	15	40.0	1 & 9	2.22	.....	2.22	13	0.67	19
August.....	67.12	45.67	21.45	56.39	77.0	16 & 17	31.0	5	2.14	.....	2.14	9	0.60	21
September...	61.56	39.65	21.92	50.61	75.0	16 & 17	23.0	27 & 28	1.78	.....	1.78	4	0.96	6
October.....	38.80	18.41	20.38	28.60	63.0	4	-10.0	30	0.18	15.50	1.73	9	0.68	21
November...	20.96	4.91	16.05	12.93	47.0	16 & 18	-24.0	30	0.14	22.00	2.34	10	0.40	9
December...	20.83	4.45	16.38	12.64	45.0	18 & 28	-35.0	1	0.03	17.50	1.78	8	0.70	16
January.....	10.90	-5.96	16.87	2.47	42.0	7	-47.0	22	.....	38.50	3.85	10	1.10	28
February....	33.03	13.68	19.34	23.35	45.0	17	-12.0	2	.....	2.00	0.20	1	0.20	19
March.....	28.61	9.22	19.45	18.94	47.0	19	-22.0	3	.....	21.20	2.12	10	0.40	22
									10.43	120.70	22.50	93		

EXPERIMENTS AT FORTS SMITH, RESOLUTION AND PROVIDENCE, NORTHWEST TERRITORIES

FORT SMITH

The season was exceptionally favourable due to the absence of the usual June, July and August frosts. All crops gave uncommon yields, and carrots weighing 1 to 1½ pounds each and cabbage 20 pounds each were obtained. Onions were 3 to 4 inches in diameter. The Prizetaker variety proved superior to Yellow Globe and Red Danvers.

SESSIONAL PAPER No. 16

The average return of potatoes was 20 bushels for 1 bushel planted. Red varieties succeeded better than white. At 20 miles from Fort Smith we have 14 acres of good land for oats, wheat and barley. From 800 pounds of oats sown, we obtained 12,000 pounds. Wheat and barley matured but were destroyed by birds.

FORT RESOLUTION

In general, the crop this year was the best ever obtained. Snow and rain hindered ploughing operations in May, and plants which germinated early in June suffered from drought and caterpillars. July and August were warm and wet, favouring the crops.

Potatoes gave the best crop ever recorded, the total yield being 650 bags, an average return of 9 for 1. Tubers were all large, some weighing $2\frac{1}{2}$ pounds. In the old fields, a superficial scab was noticed on the tubers, which, however, did not affect their edible quality. A certain number of plants suffered from a disease which may have been of a fungous origin. At the outset the plants took on a bluish hue as that of a light mould, and quickly perished. The diseased plants were unproductive. As usual, Early Rose proved the best variety. Experiments conducted during the last six years show that Wicks Extra Early, Rochester Rose, and Beaves Rose are unsuited to this region. The best result was obtained with a mixture of two white varieties, one probably being Wee McGregor, which yielded 30 for 1.

Cabbage did not succeed as well as usual owing to drought and insects, but the crop was satisfactory.

Turnips gave an excellent yield which would be hard to surpass for some varieties. Purple Top Milan was easily the best, the average weight being 10 pounds and one specimen tipping the scales at $22\frac{1}{2}$ pounds. The crop was free from disease or insects this year, although no preventive treatment was applied.

The beet crop was the best ever obtained and all other vegetable crops were splendid.

An attempt to produce our own cabbage, turnip, carrot and beet seed proved a failure as the seeds did not ripen, the season being too short and wet.

Barley was the only cereal sown. Inferior home-grown seed failed to germinate satisfactorily. Seed from Fort Smith was sown June 6. The crop was injured by frost in September and used as green feed.

Hay was abundant, owing to the wet season. Rye grass and timothy, grown on a small scale, proved satisfactory. Clover sown June 7 gave a vigorous growth and a good crop is expected for next year.

For the first time in seven years, our apple trees have blossomed, but the fruits were only the size of a small wild cherry in September. Apparently, these apple trees will never be more than an ornament. Tomatoes grown by the nuns of the Indian School were the size of an egg and proved of good quality when ripened in the house.

FORT PROVIDENCE

The season was most favourable for vegetables and hay. Potatoes, our principal crop, gave an excellent yield: 107 bags were planted about May 17 and in September, 1,687 bags containing two bushels each were harvested, after providing for the needs of the institution since August 10. Carrots, turnips, beets, cabbage, cauliflower, peas, lettuce and radish gave good crops. Onions, radish and cabbage suffered from worms.

Three bushels of barley, sown May 14, yielded 8 bushels, frost having injured the crop on June 1. The same frost completely destroyed the oats and injured the wheat, which yielded 4 bushels from 1 bushel sown.

On May 24 we sowed 1 pound of couch grass, $\frac{1}{2}$ pound of clover and 1 pound of rye in new land. Growth was excellent, especially that of clover. The crop was used as cow pasture in September.

Locusts were plentiful but fortunately they respected our crops. Large black caterpillars despoiled trees of their foliage for miles along the river.

DIVISION OF ANIMAL HUSBANDRY

REPORT OF THE ACTING DOMINION ANIMAL HUSBANDMAN,
G. B. ROTHWELL, B.S.A.

During the past year live stock work at the Central Farm has been successful with certain exceptions. In explanation of the comparatively small amount of experimental work done as compared with other years it may be stated that the season in so far as crops were concerned was a poor one. Further, the high cost of all foodstuffs and the difficulty of procuring certain feeds at any price made many contemplated lines of experimental work impossible. However, the most serious of all drawbacks was due to the fact that very heavy reactions to the tuberculin test in the dairy herd not only caused the discontinuance of experimental work, but also was responsible for a deficit in the general operations.

There are now 662 head of live stock in the stables, as follows: 146 dairy cattle, 36 horses, 175 sheep, 305 swine.

Shortage of pasture and range generally has made itself felt in two lines of work in particular, viz., sheep and swine raising. With the former, while a really excellent crop of lambs was raised, insufficient pasture was responsible for rather unsatisfactory development at the end of the season. With hogs, possibly due to the effort of this department to increase production to the limit and to consequent overcrowding, a rather serious infestation of internal parasites resulted. However, it would seem probable that greater range facilities would be available for sheep next season, and in the case of swine, reduction of the herd to normal size, together with careful treatment of all hogs for various forms of intestinal parasites, would render conditions for satisfactory work in the future better than ever before.

HORSES

The quality of the horses on this Farm has steadily improved and the stables in general present a most creditable line up. There are at present 36 horses and colts, including three drivers and 4 general-purpose or express horses. Among the Clydesdales are several registered mares of the highest quality and two promising home-bred stallions, two and three years old.

Breeding operations, while not extensive, were very successful, four good foals being raised. Prophylactic use of the vaccine treatment against joint-ill proved entirely successful. The purchase of two well known show mares, both in foal, added materially to the increase in value of the horses, which amounts to \$5,665. During the year 8,014½ days of horse labour were accounted for. Valuing horse labour at \$1 per day amounts to \$8,014.50, which covered even the unprecedented cost of horse maintenance during the winter of 1919-20.

Entries of horses were made at both the Eastern and Western Winter Fairs at Ottawa and Guelph, with most creditable results indeed. The most encouraging winnings were those of the breeding classes, where Central Experimental Farm entries topped the classes.

DAIRY CATTLE

The former representation of dairy herds is still maintained but the herds are in some cases somewhat reduced in numbers. They are as follows: Ayrshires, 43 head; French Canadians, 8 head; Holsteins, 66 head; Jerseys, 13 head; Grade Ayrshires, 5 head; Grade Holsteins, 6 head. The total of 146 head is 49 less than were on hand at the close of the preceding fiscal year. Apart from a number of

SESSIONAL PAPER No. 16

unfortunate losses during the year, the health of the herd has been all that could be desired, and production has in nearly all cases exceeded that of previous years. The replacing of some of the losses in live stock has caused a debit balance to be shown for the year.

Dairy Cattle Experiments.—Owing to some changes made in the management of the dairy herd it was not found possible to carry on as much experimental work as usual. However, the following work is to be noted:—

The study of several compounded dairy meals, which were being put on the markets and being largely advertised and sold during the period when meals were exceedingly scarce was completed. These were compared with a well-balanced home-mixed ration. The results go to show that while the ready-mixed rations and home-mixed rations were about equal for milk production, the home-mixed ration is almost invariably the most profitable as it can be procured for about two-thirds of the price of the others.

Data on the cost of rearing have again been carefully kept for all classes and ages of young stock. These figures show the desirability and economy of each farmer raising his own dairy animals and of raising them well.

The continued study and observations on the practical efficiency of various types of milking machines are making satisfactory progress.

The study of contagious abortion in cattle as reported in last year's report has been continued. This work consisted of trials of four different types of preventatives as follows:—

- 1st.—Lederle Killed Culture for pregnant animals, given in three progressive doses. Three animals treated. Results—two calved normally and third slightly premature, but not typical abortion. Treatment apparently effective.
- 2nd.—Lederle Live Culture for non-pregnant animals, one dose only. Twenty animals treated. Ten animals available for observation. Results—nine calved normally, tenth aborted upon being shipped to another herd. Treatment apparently effective.
- 3rd.—Mulford's Serrovaccine, live culture, for non-pregnant cows. One dose only. Ten animals treated. Six available for observation. Five calved normally, one aborted. One cow which calved normally was given treatment after service which theoretically should have caused abortion. This gives a negative appearance to the results of this test.
- 4th.—Health of Animals Branch, vaccine treatment. Double doses for non-pregnant cows. Eleven cows treated. Five available for observation. Four calved normally, the fifth aborted having aborted also the previous year. Treatment only partially effective.

11 GEORGE V, A. 1921

Dairy Cattle Returns.—The following table shows the average production of the 67 cows which completed a lactation period during the year. The table also shows the production of the five best and the production of the total herd of each breed of cattle. The figures are very gratifying showing as they do uniformly high production and profits throughout, the French Canadians being the only breed to fall below the average of the preceding year:

AVERAGES

Number of Head.	Breed	Age	Average days in milk	Average lbs. milk produced	Average per cent fat in milk	Average profit over cost of feed between calvings. Labour, manure and calf. not included
		Years	Days	lb.	%	\$ cts.
67.....	All breeds and ages.	5	311	8,153.07	3.93	91 66
5 best.....	Ayrshire.....	7	349	10,276.50	3.89	114 87
20 total herd.....	Ayrshire.....	6	309	7,280.80	3.96	76 93
5 best.....	French Canadian....	4	285	6,466.00	4.6	90 05
7 total herd.....	French Canadian....	4	279	5,817.50	4.48	76 11
5 best.....	Holsteins.....	6	313	14,531.30	3.52	149 02
19 total herd.....	Holsteins.....	6	328	9,946.70	3.58	98 48
5 best.....	Jerseys.....	5	328	7,653.60	5.33	129 84
10 total herd.....	Jerseys.....	5	290	6,353.10	5.17	102 69
4 best.....	Gr. Ayrshire.....	6	314	7,366.50	3.86	83 86
4 total herd.....	Gr. Ayrshire.....	6	314	7,366.50	3.86	83 86
5 best.....	Gr. Holstein.....	6	333	11,826.00	3.61	126 35
7 total herd.....	Gr. Holstein.....	6	325	11,133.20	3.51	114 35

Official Records.—This year again a number of the cows and heifers of the various breeds were entered for official records. These, under very ordinary conditions for test work, made the following records in the respective tests:—

CANADIAN RECORD OF PERFORMANCE TESTS ON CENTRAL FARM, APRIL 1, 1919, TO MARCH 31, 1920.

Name and Number of Cow	Breed	Age at commencement of test	No. days milking	Pounds Milk produced	Pounds fat produced	Average per cent fat
		Years				
Canaan Beauty 2nd 21172	Holstein	6	334	18,072	603	3.34
Helena Keyes Posch 21376.....	Holstein.....	6	350	20,205	655	3.24
Ottawa March Ormsby 36769.....	Holstein.....	3	278	10,017	347	3.47
Ottawa Pietartje Ormsby 44451...	Holstein.....	2	333	10,291	422	4.10
Topsy Keyes 15669.....	Holstein.....	9	285	10,907	381	3.50
Balmangan Queen 2nd 48431.....	Ayrshire.....	6	278	9,762	389	3.98
Duchess of Briarcrest 50109.....	Ayrshire.....	4	352	11,735	507	4.32
Flavia 7th of Ottawa 52310 (app.).	Ayrshire.....	2	248	6,661	279	4.19
Ottawa Kate 29601.....	Ayrshire.....	12	323	10,511	416	3.95
Denise Fortune 3807.....	Fr. Canadian.	3	344	10,133	471	4.65
Nevas Princess 8065.....	Jersey.....	3	354	8,151	437	5.36

SESSIONAL PAPER No. 16

HOLSTEIN RECORD OF MERIT TESTS ON CENTRAL FARM, APRIL 1, 1919, TO MARCH 31, 1920.

Name and number of cow	Age at commencement of test			Number days on test	Pounds milk	Pounds fat	Pounds 80% Butter
	Years	Months	Days				
Butter Boy Keyes 2nd Lass 19686..	7	11	6	7	541.5	20.13	25.17
Butter Boy Keyes 2nd Lass 19686..	7	11	6	30	2,221.0	80.91	101.14
Canaan Beauty 2nd 21172.....	7	4	24	7	611.0	19.77	24.71
Canaan Beauty 2nd 21172.....	7	4	24	30	2,565.9	82.27	102.84
Conway Posch Butter Girl 19685...	8	0	21	7	458.0	16.76	20.96
Conway Posch Butter Girl 19685...	8	0	21	30	1,929.0	68.57	85.72
Helena Keyes Posch 21376.....	6	8	23	60	5,941.5	176.51	220.64
Helena Keyes Posch 21376.....	6	8	23	90	8,452.5	252.49	315.61
Jewel Belle Dewdrop 2nd 20244.....	7	10	9	7	448.0	15.73	19.66
Jewel Belle Dewdrop 2nd 20244.....	7	10	9	14	831.0	30.25	37.82
Korndyke Canary Butter Maid 49648.....	2	5	24	7	404.5	15.42	19.28
Korndyke Canary Butter Maid 49648.....	2	5	24	30	1,545.5	55.25	69.07
Ormsby Rhoda Maud 44200.....	2	11	5	7	354.5	12.86	16.07
Ormsby Rhoda Maud 44200.....	2	11	5	30	1,431.5	50.41	63.01
Ottawa Bessie Ann 27130.....	6	9	3	7	587.5	21.04	26.31
Ottawa Bessie Ann 27130.....	6	9	3	30	2,303.0	80.37	100.47
Rosa Bonheur Flower 24620.....	6	9	4	7	469.5	15.30	19.13
Rosa Bonheur Flower 24620.....	6	9	4	30	1,898.5	61.02	76.28
Topsy Keyes 15669.....	9	0	12	7	453.0	16.48	20.61
Topsy Keyes 15669.....	9	0	12	30	1,909.5	66.77	83.47

Exhibitions.—This year a start was made in exhibiting live stock in open competition at the fairs. Two junior Ayrshire bull calves were shown at the Ottawa winter fair and had the distinction of winning first and second in their class. These animals have since been sent to Branch Farms to head the Ayrshire herds maintained there. It is proposed to enlarge upon this work at the coming fall and winter fairs.

SHEEP

The flock of sheep is composed of Leicesters and Shropshires of good type and quality. At the close of the fiscal year there were 175 head in the flock. The flock is still handicapped by lack of pasture which is largely responsible for the rather poor returns this year, there being a small debit balance. Next year unlimited range for sheep will be available, therefore a much better showing is expected. Some sheep were exhibited at the Ottawa Winter Fair but not with the signal success attending the exhibition of cattle. However, they made a creditable showing.

SWINE

There are now 305 swine of all ages on the Central Farm, a larger number than ever maintained before and an increase of 26 over the previous year. Many difficulties were met with in reference to experimental work, due, first, to a very dry early summer which made necessary the discontinuance of pasture experimental work with sows and growing pigs; second, to the results of a more or less severe infestation of intestinal parasites manifesting itself in the young and growing hogs; and third, to the difficulty in securing efficient hog-men to carry on such a fairly large enterprise. However, some excellent results were obtained.

While a large gross turnover was shown, \$8,306.25, the actual profit was less than in other years due to high cost of feeds and labor, little demand for breeding stock, low selling price and to other causes already mentioned. However, accounting for all regular debit items, extra labour for experimental work, losses, etc., and in a year notable as one of the worst in the history of swine raising, a profit of \$204.16 is shown

11 GEORGE V, A. 1921

Summer Experimental Work.—The main experiment of the summer dealt with features already partially demonstrated the previous year. Pasture and limited grain vs. trough feeding vs. self-feeder (both fed outside) vs. trough and self-fed lots (inside feeding).

The results of this test indicated a cost per pound gain as follows:—

Pasture and limited grain.. . . .	9.7 cents
Trough fed (paddock).. . . .	10.3 "
Self-fed (paddock).. . . .	9.8 "
Trough fed (inside).. . . .	8.6 "
Self-fed (inside).. . . .	9.3 "

Conclusions

1. Pasture feeding using a limited grain ration (trough fed) proved slightly more economical than where the self-feeder free choice system was used the year before, considering the higher cost of all feed.

2. That the self-feeding method proved slightly more expensive in cost per pound, but that the hogs so fed were ready for market from ten to fifteen days earlier.

3. That the self-feeder is a good hog fattener, but not to be recommended in the growing of young breeding stock. Trough feeding in this experiment proved more economical indoors. In outside feeding the reverse was the case.

4. That hogs fed in cool indoor quarters supplied with earth, charcoal, etc., and with a reasonable amount of green feed, make more economical gains than those similarly fed outdoors. Sun scald and sun burn generally is a most serious condition with the young white skinned hog.

Tankage vs. Fish Meal.—Three lots of 10 pigs each were self-fed meal and were supplied with: Lot 1, tankage, Lot 2, fish-meal, in separate self-feeders. Lot 3 was given no supplement.

Tankage fed lot cost.. . . .	9.9 cents per pound gain.
Fish-meal fed lot cost.. . . .	9.4 " " "
Lot receiving neither.. . . .	9.89 " " "

The fish-meal fed pigs compared very favourably with the check lot fed meal and milk at a cost of 9.3 cents. Previous tests have indicated excellent possibilities for fish-meal as a supplementary hog feed, and it is proposed to carry out more extensive work in this line.

The Self-Feeder.—Throughout all tests where self-feeders were checked against the trough-feeding method the average results bore out previous findings that about one-tenth of a pound more meal was required per pound gain with the former method, which does not balance the saving of labour so effected.

Summer-Housing.—Several types of summer cabins were kept under observation: (1) the A-shaped cabin; (2) the straight-walled cabin with tight sides; (3) the latter cabin with (a) roof-section hinged (b) one side hinged upward (c) roof-section and both sides hinged and hooked upward. The latter cabin (c) is infinitely superior for summer use affording relatively cool shelter. Hogs housed in tight-sided cabins preferred to lie outdoors in the sun, to the stuffy interior, while the improved type of cabin was highly popular on hot days. By closing the roof section, and lowering and securely fastening the hinged sides, this cabin is equally as useful for winter use as the tight-sided type.

Intestinal Parasites.—Carrying such a large number of hogs on limited area for the several previous years, has, apparently, resulted in parasitic infestation of a more or less severe character, a fact that has in the past caused rather serious losses with young pigs from five to eight weeks of age. All of this has resulted, notwithstanding the fact that summer quarters are changed, in following the regular swine rotation.

SESSIONAL PAPER No. 16

With the assistance of the Chief Pathologist of the Health of Animals Branch, it was demonstrated that in all probability the trouble with the young pigs was due to the effect of the larval stage of the common round worm (*Ascarus*). This stage is passed in the lungs, and causes excessive coughing, pneumonia, dry, pale skin, staring coat, indigestion and diarrhoea. Considerable investigational work was carried on in the Health of Animals laboratories, where it was found that other parasites, in particular the lung worm, were present.

It being impossible to treat the animal for this lung infestation the only method open was a treatment calculated to rid the sow of the adult worm responsible for the eggs, which in turn were taken up by the young pigs. The treatments took the form of the administration of:—

1. Oil of chenopodium and castor oil.
2. A proprietary anthelmintic in capsule form, made by the Funk Hog Farm, Bloomington, Ill.
3. A proprietary treatment consisting of oil of chenopodium and calomel administered in capsule form, known as Chencal.

All brood sows were treated before coming in to winter quarters, and are to be treated again before being placed in the farrowing pens. These pens are subject to thorough disinfection consisting first of thorough washing and hosing, disinfecting with a very strong solution of Wescol, followed by the application of dehydrated lime several days before the sow is brought in. While, at this juncture, it is impossible to make any statement of results, all litters so far appear healthy, but have not reached the age, as yet, when the results of the infestation are apparent. It is the intention to follow this line of investigation carefully for some years. Apparently there are many of the larger herds in Canada suffering from one or more forms of parasitic infestation so far little understood by the practical feeder.

Winter Experimental Work

Winter Housing.—A large number of hogs were fed during the winter months to throw further light on the question of types of winter shelters best adapted. The results in general are as follows:—

Fall litters fed outdoors with a large shed and straw covered berth for shelter, showed little tendency to rheumatism or crippling, but did not develop properly. Hogs of the same age fed in a closed shed showed better gains, but greater tendencies to crippling, while in a warm piggery practically the same result was noticeable. The practical observation was that the best method of raising fall litters is to supply a low straw covered berth in a well protected shed with access to a barn-yard. Two important points were noted,—first, that young pigs should not be fed in lots of more than ten or twelve and, second, that they should be three months of age before being subjected to outside conditions.

Summer Litters

Finishing.—

1. Lots fed indoors showed good gains, but greater tendencies to go off their feet or cripple. Average cost of indoor feeding, 12·1 cents per pound.

2. Lots fed in a closed shed showed in this instance equal liability to crippling, which was at variance to previous findings and likely due to overcrowding. Average cost of feeding, 12·3 cents per pound.

3. Lots self-fed in an open shed with yard and sleeping berth; no crippling; cost to produce one pound gain, 11·5 cents. Trough-fed (as above), 2 per cent showed signs of crippling; cost to produce one pound gain, 11·76 cents.

11 GEORGE V, A. 1921

NEW BUILDINGS

Besides a well equipped slaughter-house, there has been added a very complete little smoke-house with facilities for curing and smoking meats. During the past winter large numbers of hogs have been butchered and sold to farm officials and employees at market prices. A very serviceable cheap type of shed piggery with yards has been constructed with different interior arrangements. This has proven most satisfactory, illustrating as it does, the fact that expensive buildings for swine are not only unnecessary but less successful as well.

BRANCH FARMS

Owing to partial disorganization of the Animal Husbandry Division and to the press of routine work at the Central Experimental Farm, the Acting Dominion Animal Husbandman was unable to visit the Branch Farm System other than certain Farms in the province of Quebec. Every effort, however, has been made toward the assistance of Superintendents in the purchase of stock, feeds, etc., and in every way possible through correspondence.

BUILDING PLANS

While little building work has been under way, a number of plans for buildings on the Farm System have been prepared. It is hoped to begin operations upon the much needed dairy building at the Central Experimental Farm early in the next fiscal year.

Over 600 plans and specifications of farm buildings have been forwarded to farmers throughout the Dominion. This line of assistance has become exceedingly popular and is only held back by lack of staff.

MISCELLANEOUS

The Acting Dominion Animal Husbandman, together with the staff of assistants, has visited numbers of exhibitions, shows, meetings, demonstrations and short courses. Considerable judging work has been undertaken throughout Ontario and Quebec. Increased correspondence and routine work, in general, has taken up much of the time of the staff.

DIVISION OF FIELD HUSBANDRY

REPORT OF THE ASSISTANT DOMINION FIELD HUSBANDMAN,
W. L. GRAHAM, B.S.A.

The soil cultural and rotation experiments that have been under investigation for several years now have been continued at the Branch Experimental Farms and Stations, and at the Central Experimental Farm at Ottawa.

The cost of production of crops grown under field and rotation experiment conditions has received considerable attention and data of results compiled, which are available for distribution to the farmers of Canada.

The shallow versus deep ploughing experiment which has run now for sixteen years has been concluded and while yields in the different plots varied considerably from year to year, there has been no appreciable difference in the returns from the two systems of cultivation for the whole period.

SESSIONAL PAPER No. 16

WEATHER CONDITIONS AND CROP YIELDS

In spite of unfavourable weather conditions the crops at the Central Experimental Farm at Ottawa have been fairly good. The dry weather that set in early in the season was not conducive to record yields, but a yield per acre in an off year of 51 bushels of oats, 14 tons of ensilage corn, 14 tons of mangels and over 2½ tons of hay is sufficient to demonstrate that by proper cultural methods and the following of a suitable rotation, the effects of adverse weather conditions can be reduced to the minimum.

YIELD OF FIELD CROPS, CENTRAL EXPERIMENTAL FARM, 1919.

Crop	Area	Total Yields				Average Yield per Acre			
		acres	tons	lb.	bush.	lb.	tons	lb.	bush.
Corn	40	562	1,470	.....	.....	14	136	.....	.....
Roots.....	3	43	1,675	.....	.....	14	1,225	.....	.....
Oats.....	34	..	..	1,757	24	..	..	51	23
Oat straw.	34	36	13	.....	.....	1	118	.....	.....
Hay.....	40	103	140	.....	..	2	1,153	.....	..

COST OF PRODUCTION OF FIELD CROPS, 1919

The data obtained on the cost of production of field crops are determined from fixed cost and return values. This is necessary in our work in order that the rotation and individual plot results within a rotation may be compared. This year the cost of production is not high when compared with the yield:—

Crop	Area	Yield per acre	Cost to Produce		
			Per acre	Per ton	Per bush.
	acres	tons	\$	\$	cts.
Mangels.....	3	14.61	487	39 08	2 67
Ensilage corn.....	40	14.06	.....	26 88	1 91
Oats.....	34	..	51.6	16 81	26.25
Oat straw.....	34	1.06	.....	3 08	.....
Hay.....	40	2.57	.....	20 61	8 00

ROTATION OF CROPS

For various purposes, fifteen rotations are under way at this Farm. From these tests important conclusions have already been drawn, and the results now being obtained are providing valuable data. The rotations being conducted under regular farm conditions are as follows:—

Rotation "A" (five years' duration).—First year, hoed crop, manured; 2nd year, grain seeded down with clovers and grass; 3rd year, clover hay, top dressed with manure in autumn; 4th year, timothy hay, field ploughed in August, top worked and ribbed up in October; 5th year, grain seeded down with red clover to be ploughed under the following spring, when the succeeding hoed crop is corn.

Rotation "B" (five years' duration).—First year, hoed crop, manured; 2nd year, grain, seeded down with clovers and grass, top dressed with manure in autumn; 3rd year, clover hay, ploughed in autumn; 4th year, grain seeded down with clovers and grass; 5th year, clover hay.

Rotation "C" (four years' duration).—First year, hoed crop, manured; 2nd year, grain seeded down with clover and grass; 3rd year, clover hay; 4th year, timothy hay field ploughed in August, top worked and ribbed up in October.

11 GEORGE V A. 1921

Rotation "D" (three years' duration).—First year, hoed crop; manured; 2nd year, grain, seeded down with clovers and grass; 3rd year, clover hay.

Soiling Crop Rotation "R" (three years' duration).—First year, corn for early fall feed, manured; 2nd year, clover hay to cut green.

The records for the past year from the rotations outlined in the foregoing are given herewith.

COST, RETURNS, AND NET PROFITS OR LOSSES FROM ROTATIONS, "A", "B", "C", "D", AND "R", 1919.

Rotations	Cost to operate per acre	Value of returns per acre	Profit or loss per acre
	\$ cts.	\$ cts.	\$ cts.
"A" (five years' duration).....	19 81	19 88	0 07
"B" (five years' duration).....	19 55	16 75	-2 80
"C" (four years' duration).....	19 27	16 60	-2 67
"D" (three years' duration).....	21 68	19 12	-2 56
"R" (three years' duration).....	21 83	22 15	0 32

SUMMARY OF RESULTS OF ROTATIONS "S" AND "P"

Shallow ploughing versus deep ploughing

Year	Rotation "S" Shallow ploughing and sub- soiling			Rotation "P" Deep Ploughing		
	Cost of operation per acre	Value of crop per acre	Profit per acre	Cost of operation per acre	Value of crop per acre	Profit per acre
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1904.....	19 89	22 98	3 09	19 89	22 98	3 00
1905.....	22 88	36 74	13 86	22 89	36 89	14 00
1906.....	19 35	25 06	5 71	19 39	24 93	5 54
1907.....	20 13	27 63	7 50	20 29	27 41	7 12
1908.....	15 84	20 21	4 37	16 03	20 34	4 31
1909.....	16 65	25 64	8 99	17 05	25 80	8 75
1910.....	13 67	23 36	9 69	14 42	23 60	9 18
1911.....	14 24	26 25	12 01	14 53	26 72	12 19
1912.....	19 47	27 14	7 67	19 02	28 99	9 97
1913.....	18 13	17 71	-0 42	17 52	18 34	0 82
1914.....	17 96	20 33	2 37	17 36	21 12	3 76
1915.....	19 02	25 70	6 68	18 84	24 35	5 51
1916.....	18 83	22 76	3 93	18 84	21 55	2 69
1917.....	19 38	25 70	6 32	19 36	23 29	3 92
1918.....	20 10	25 88	5 78	20 14	22 84	7 70
1919.....	19 92	20 29	0 37	19 89	20 71	0 82
Average 16 years.....	295 46 18 47	393 38 24 59	97 92 6 12	295 48 18 47	269 86 23 12	99 28 6 20

New experiments are under way, the data from which will not be available to the public for several years yet.

DIVISION OF HORTICULTURE

REPORT OF THE DOMINION HORTICULTURIST, W. T. MACOUN

The season of 1919 was a favourable one for fruits and vegetables on the whole at the Central Experimental Farm. One of the best crops of apples in the history of the orchard was gathered. The plum crop was also good, and the season proved particularly favourable to grapes, many varieties of which ripened. There were also good crops of small fruits such as strawberries, currants, gooseberries and raspberries. It was a favourable season also for vegetables, though the potato crop was not as large as in some other years.

FRUITS

Breeding New Varieties.—The work in improving varieties of fruits was given special attention this season, strawberries, raspberries, gooseberries, grapes, and hardy apples for the northwest being stressed particularly.

Crosses were made among strawberries, the following parents being used both as males and females where the variety is perfect, or only as females in the case of their being imperfect: Bisel, Beder Wood, Early Jersey Giant, Francesca, Greenville, J. H. Cooke, Mele, New Globe, Parson Beauty, Pocomoke, Portia and Valeria.

In raspberries the following were used as parents: Brighton, Cuthbert, Herbert, Loganberry, Newman 23, *Rubus odoratus*, and St. Regis. All were selfed, and intercrossed, reciprocals being made in every case.

Breeding work in gooseberries consisted of crosses between the most promising American varieties and the best English and *Grossularia* varieties. Some four or five hundred crosses between *R. oxyacanthoides*, *R. Cynosbati* and *Grossularia*, made in the Horticultural Division at the Central Farm, fruited in 1919. From these several promising bushes have been isolated, among them being a few thornless ones bearing medium-sized fruit. These will be used for future breeding work.

Freedom from mildew, combined with the size and quality of the English varieties, and the retaining of productiveness are the aims. If thornlessness can be incorporated without impairment of the other factors so much the better.

As previously mentioned the work with apples was entirely for the improvement for the northwest of the existing hybrid crabs. Crosses and reciprocal crosses were made, using the best of several crosses which had already fruited, and the best hardest commercial sorts. Among the hybrid crabs, Rosilda, Redman, Lora, Printosh, were used while from the commercial sorts, Duchess, Wealthy, McIntosh, and Dudley were selected.

Promising New Varieties

Many of these new varieties of apples, plums and small fruits were originated at the Central Experimental Farm, Ottawa, Ont.

Apples.—Attention is again called to some promising varieties of apples originated by this Division. Among these is Melba, which appears to be finding a place in commerce. It is a very beautiful, high quality, early apple of good size. This variety is doing well in Nova Scotia and good reports have been received of its behaviour in various parts of Canada. Resembling McIntosh in quality and bouquet, the season of that superb variety is thus extended to August.

Following Melba in season there is Joyce, another apple of the McIntosh class which is finding favour. Both these varieties possess that high colour so desirable in early sorts, and this, combined with their quality, places them in the first rank of early sorts.

11 GEORGE V, A. 1921

Niobe is a seedling of Northern Spy and a mid-winter variety, of high quality. It is now in the hands of nurserymen, and should be on the market in large numbers in a few years.

Plums.—The list of good varieties of plums which may be grown in the coldest parts of Ontario and Quebec is being gradually extended in a most encouraging manner. The Omaha and Emerald plums, both productions of the late Theodore Williams of Nebraska, are very desirable. These are hybrids between Americana and Triflora. The Omaha is an early variety of very good size, handsome appearance and good quality. It is an excellent shipper, and the tree is hardy and a regular bearer. The Emerald is very similar to the Omaha but much later. Both varieties deserve a place in the plum orchards of Eastern Ontario and Quebec.

In the Horticultural Division special attention is being paid to the improvement of the native plum, *Prunus nigra*. To date, from a large number of seedlings of these native plums, two have been selected as worthy of name. They are Ottawa and Rideau. On account of their extreme earliness these are particularly valuable. They come early in August long before most varieties of plum are ready. They make excellent jam and jelly and are rapidly increasing in popularity on the markets, so that it is questionable whether they are not our most profitable plum. For the past two years they have sold on the Ottawa market for from seventy-five cents to one dollar and a quarter for six-quart baskets. The opportunities contained within the species Nigra are many, and crossed with Triflora this species should give some varieties equal to the best now grown in the large fruit districts. Growers will do well to pay more attention to the improved and earliest varieties of Nigra.

Small fruits.—Portia strawberry is a new variety originated at the Central Experimental Farm, which has demonstrated its fitness as a canning and shipping berry of unusual merit. This variety is an imperfect sort and requires a pollinizer for which purpose Parson Beauty seems suited.

Among gooseberries the Horticultural Division is introducing the variety Mabel. This berry has been outstanding in yield, vigour, and freedom from disease. It is also large and of good quality. It is hoped to introduce this variety to the trade during the next season.

The Kerry black currant, another Experimental Farm variety has, together with the Saunders and Climax, been introduced to the trade. Reports from commercial plantations of these varieties are very encouraging.

A new variety of raspberries, Newman No. 23, originated by Mr. C. P. Newman, Villé la Salle, Que., which has been under test here for some few years, gives promise of great things. This variety, not yet introduced and still held under restriction, is outstanding in firmness, and therefore an excellent canner and shipper. It is of large size, good colour and is a heavy cropper. Altogether it is the most promising new commercial variety.

Among early raspberries nothing in the Horticultural Division trial plots has equalled Count or Brighton, two Experimental Farm crosses. The former of these is probably the better shipper and yielder, but both are exceptionally early and of very good quality for early sorts. They are now being multiplied on a large scale.

VEGETABLES

Most of the experimental work with vegetables in progress in recent years was continued in 1919, and some interesting results were obtained. The breeding of new varieties of early vegetables continues to be an important part of the work, and some of those originated at the Central Experimental Farm gave a good account of themselves.

SESSIONAL PAPER No. 16

Corn.—The early Malcolm and Sweet Squaw corn have been introduced to the trade and are finding favour in many quarters. These are both earlier than the Golden Bantam, and are good sorts to lengthen the season of corn of high quality. The Sweet Squaw is particularly suitable for the Prairie Provinces. The Pickaninny, a dwarf black seeded variety, is still earlier than either of these other varieties, and is proving a very useful corn.

Potatoes.—Many experiments with potatoes have been carried on in the Horticultural Division during the past twenty-five years, but in recent years two experiments have been given special attention at Ottawa. These are in regard to time of planting and source and quality of the seed.

Source and Quality of Seed.—Since 1907, experiments have been in progress at Ottawa in comparing the results from seed potatoes of the same variety from various sources, from selected and unselected tubers, from different dates of planting, from different dates of digging, and from different methods of storing in order to determine how to get the best seed. The results of this work up to 1917 were reported upon in Bulletin No. 90, "The Potato in Canada," by the writer. The last few years' experimental work has proved that the great differences obtained in yields of the same variety at Ottawa are not due to seed from any particular time of planting or digging, nor to methods of selection or storage, but the great differences in yield depend on whether the potatoes were grown the previous year near other potatoes with poor tops, which poor tops had been caused by one of the obscure physiological diseases to which the plant pathologists have been paying particular attention in recent years.

The following table shows the results obtained in 1919 from Central Experimental Farm Green Mountain seed which had been grown in 1918 from potatoes which had been giving very poor crops for several years as compared with stocks obtained from the cooler parts of Canada. These results, it is believed, prove that most of the differences between the yields from seed brought from the cooler parts of Canada, and seed secured at Ottawa and other places in Ontario are due to the fact that certain as yet obscure diseases are not prevalent, or do not cause material reduction in the crop, where the climate is relatively cool. Experiments in this direction are being continued.

Variety	Source of Seed	Total Yield per acre		Yield per Acre marketable		Yield per Acre unmarketable	
		bush.	lb.	bush.	lb.	bush.	lb.
Green Mountain.....	C.E.F., Ottawa...	330	00	286	00	44	00
Green Mountain.....	Fredericton, N.B.	312	24	299	12	13	12
Green Mountain.....	Northern Ontario.	299	12	277	12	22	00
Green Mountain.....	Rimouski, P.Q....	206	48	193	36	13	12

Dates of Planting Potatoes.—Irish Cobbler, an early variety, and Green Mountain, a medium late sort, were used.

Irish Cobbler was planted May 15 and 29, and June 12 and 26, in 1915; May 14 and 27, and June 10 and 24, in 1918; May 17 and 31, and June 14 and 28, in 1919. Three years' average yields per acre of marketable potatoes were: 1st planting, 324 bushels, 42 pounds; 2nd planting, 249 bushels, 42 pounds; 3rd planting, 207 bushels, 32 pounds; 4th planting, 124 bushels, 40 pounds.

Green Mountain was planted May 15 and 29, and June 12 and 26, in 1915; May 12 and 26, and June 9 and 23, in 1917; May 14 and 27, and June 10 and 24, in 1918; May 17 and 31, and June 14 and 28, in 1919. Four years' average yields per acre of marketable potatoes were: 1st planting, 307 bushels 27 pounds; 2nd planting, 264 bushels 51 pounds; 3rd planting, 236 bushels 24 pounds; 4th planting, 79 bushels 45 pounds.

11 GEORGE V, A. 1921

It will be seen that there was a regular decline in yield from the first to the fourth dates of planting in both varieties.

These results confirm those which were obtained years ago when a test was made of different dates of planting for six years; it was found then that the highest average yields came from the earlier plantings, as has been the case at Ottawa in these later experiments. These results have been found to be true of all parts of Canada with, perhaps, the exception of the Maritime Provinces.

Tomatoes.—For the past twenty years experiments have been in progress in tomato breeding. One of the chief objects in this work was to obtain a variety which would ripen a large proportion of its crop in the early part of the season when prices were high. The Alacrity tomato, resulting from this work, has been on the market for some years. It has proven particularly valuable in the cooler parts of Canada where it is difficult to ripen a large proportion of the tomato crop. Very favourable reports were received of this variety in 1919. Crosses have been made to obtain, if possible, a smoother variety that would be just as early. Two of the most promising of these are Alacrity x Earlibell and Alacrity x Hipper.

Peas.—Experiments in breeding new varieties of garden peas have been made for the purpose of obtaining more productive early varieties with large pods and peas. Some of the most promising crosses in 1919 were English Wonder x Gradus and McLean Advancer x Gradus.

VEGETABLE SEED PRODUCTION

Experiments were continued in 1919 in growing biennial vegetable seed including beets, carrots, cabbage, onions, parsnips, celery and salsify, and useful information was obtained in regard to cultural methods and storage.

HOME CANNING

Experimental work in canning fruits and vegetables was continued in 1919. Different varieties were compared for canning purposes and various recipes tried. Demonstrations were given to the public which proved very popular. A bulletin giving the results of two seasons' experimental work called, "Preservation of Fruits and Vegetables for Home Use," was published, and proved very useful.

GREENHOUSES

Experiments were continued in the greenhouses in 1919 with the principal vegetable crops such as tomatoes, lettuce and cucumbers. A variety of tomato called Grand Rapids is very promising for the fall crop as it sets better than some of the others. Experiments in testing different varieties of head lettuce were continued, and it was found that the Early Paris gave best results. This lettuce has given the best average for three seasons, and is recommended as a non-scalding variety. There is a very fine collection of chrysanthemums at the Experimental Farm for comparison of varieties, and thousands of visitors took the opportunity of seeing these when they were in bloom. Particular attention was paid to the development of new varieties of geraniums in 1919 as in previous years.

ORNAMENTAL GARDENING

The ornamental grounds at the Central Experimental Farm are very attractive to the public, and there was a large number of visitors in 1919 to see the experimental work with trees and shrubs and herbaceous plants. The rose garden is of particular interest to specialists in this flower as there are many varieties under test. Fine collections of paeonies, iris, phlox and other special flowers may also be seen and the varieties compared.

SESSIONAL PAPER No. 16

BRANCH FARMS AND STATIONS

A visit was paid to each of the Experimental Farms and Stations in 1919 by the Dominion Horticulturist, and he also visited the sub-stations at Fort Vermilion and Beaverlodge, in the Peace River District. In this district small fruits such as raspberries, currants, gooseberries, and strawberries, succeed well, but tree fruits are difficult to grow. Most vegetables succeeded admirably and flowers bloom in abundance.

CORRESPONDENCE

Brief reference is made to the correspondence, which, however, is one of the chief features of the work and takes much time. Notwithstanding the many agencies in Canada for disseminating information in regard to horticulture, the correspondence of the Horticultural Division steadily increases. It is felt, however, that this is very useful work, as anyone taking the trouble to write for information desires to get it and is likely to profit by it.

POULTRY DIVISION

REPORT OF THE DOMINION POULTRY HUSBANDMAN, F. C. ELFORD

The year 1919-20 may be considered a fairly satisfactory year in poultry keeping, for though production was comparatively poor and feed high, the demand for all kinds of poultry produce, hatching eggs and breeding stock, reached a high-water mark.

The winter of 1918-19 was mild and resulted in a comparatively high egg production, but the following spring was cold and backward and the hatching correspondingly late and unsatisfactory. The pullets being late were not matured in the fall and the past winter was very cold and the egg yield low. The supply of new laid eggs was so far below the average that dealers complained that the receipts were very much smaller than they had expected. Coupled with the low production was the continued high price of feed, all of which made production somewhat discouraging. On the other hand, the prices for eggs have been high. In some cities, new lays brought as much as \$1.25 a dozen and even \$1.50 was paid in exceptional cases. The demand for stock has also been good. The high prices in general have induced many persons to go into the poultry business, including a large number of returned soldiers. The city poultry keeper who kept a few hens in his back-yard during the war found that it paid, and he is still continuing to produce new laid eggs for his own table.

The war has eliminated a good many of the nondescript poultry keepers, and also the mongrel hens, and this has helped to put the poultry business on a better basis. Commercial poultry keeping is increasing, and those who are engaged in it in a large way are proving that it is a sound financial proposition, if handled as any business should be handled.

Therefore, though production was light and feed high, there was a ready sale for everything that was produced, and those engaged in poultry production as a business, a side-line or a hobby, have found that when proper methods were employed the results for the past year were satisfactory.

GENERAL WORK OF THE DIVISION

The work of the Poultry Division has continued to grow. At the end of the year the list of Farms conducting a poultry plant is as follows. The list includes the number of females and varieties of birds at each plant at the end of January, 1920:—

Station	Barred Plymouth Rocks	White Wyan- dottes	White Leghorns	R. I. Reds	Buff Orping- tons	Total
Agassiz, B.C.....	169	37	155			361
Brandon, Man.....	119	113				232
Cap Rouge, P.Q.....	334					334
Charlottetown, P.E.I.....	94		317			411
Fredericton, N.B.....	118	74	35	16		243
Invermere, B.C.....	136	30				166
Indian Head, Sask.....	134	142				276
Kentville, N.S.....	139	106				245
Lacombe, Alta.....	141	110		94		345
Lennoxville, P.Q.....	206					206
Lethbridge, Alta.....	183	53				236
Nappan, N.S.....	69	16	95			180
Rosthern, Sask.....	129					129
Sidney, B.C.....		261				261
Scott, Sask.....	142	21			56	219
Ste. Anne de la Pocatière, P.Q.....	84	70				154
Summerland, B.C.....		225				225
Ottawa, Ont.....	192	57	315			564
Totals	2,389	1,315	917	110	56	4,787

There are also a number of turkeys at Ottawa, Lethbridge, and Invermere, and geese and ducks at Ottawa and Kentville.

The demand for bred-to-lay cockerels from pedigree stock has been much larger than the supply. Breeding eggs are supplied in limited quantities, and more incubation space has been added to the equipment at a number of the Stations in order to supply day-old chicks to some of those who are so situated that they cannot hatch their own chicks early enough.

After several years' experimentation and observation, it must be admitted that there are sections in Canada where it does not seem practicable to attempt to hatch early chicks, and this applies to farmers as well as to others. The only way for poultrymen in such districts to secure winter egg production is to be able to purchase at a reasonable price, from a reliable source, early hatched day-old chicks. At the present time this supply is not available, and until such chicks can be purchased through other sources, this division is endeavouring to help by supplying a part of this demand.

Most of the Branch Farm poultry plants are now developing pedigreed stock and have reached a high average production and some record yields. This is particularly the case with Sidney, Vancouver island, and Indian Head, Sask., where good averages and high individual records have been obtained. A number of other Stations have done well, and though no exceptional individual records have been obtained, high averages have been secured at Agassiz, Lethbridge, Lacombe, Brandon, Lennoxville, and Kentville, which speak well for stock and management.

INVESTIGATIONAL AND EXPERIMENTAL WORK

The breeding for higher egg production under the supervision of Mr. George Robertson has been receiving attention throughout the whole system. More detail of this will be given in later paragraphs.

Poultry houses have received continued consideration. The results from the straw-loft farmers' house are still satisfactory. At the present time this house is

SESSIONAL PAPER No. 16

providing the very best of conditions and is, in most locations, the one which is recommended for the accommodation for one hundred or more birds.

The work on turkeys and waterfowl which, for several years, has not been emphasized, is being taken up again, and it is expected that further investigation on the diseases and breeding of turkeys and waterfowl will be conducted.

Considerable data have been secured on feeds and feeding, in connection with all ages of birds, various rations for chicks, electric light for egg production, pituitary substance as a stimulant, etc. Work on incubation and brooding has been continued and further investigations on diseases carried on.

BREEDING AND PEDIGREE WORK

Pedigree breeding work has been carried on at the Central Farm for years. It is intended gradually to extend this work until it is conducted on every Farm of the entire system. The ultimate aim is to produce heavy laying strains from the leading varieties of fowl, always keeping in mind standard qualities.

Unfortunately, at the start, owing to limited accommodation, progress was not as rapid as could be wished, so instead of working on the two, it was deemed advisable to overlook the standard qualifications and devote attention entirely to laying qualities.

This year, with a view of getting started on standard lines, about sixty exhibition bred White Leghorn pullets are being carried over, and it is hoped that enough heavy producers may be secured to give a foundation for a new line.

To carry on pedigree breeding each bird is leg banded, the band being stamped with the number representing the individual bird and letters are used to indicate the year, thus: A-1, B-1, C-1. This would indicate that A-1 was hatched a year before B-1, and B-1 a year before C-1. Trap-nests are used, and when a hen enters the nest to lay she is "trapped" until the attendant takes her out of the nest, notes the number of her leg band and marks it on the egg. Each hen is credited with every egg she lays, and in the breeding season records are kept of the eggs set and the chicks hatched. On the 18th day of incubation the eggs are put into covered wire baskets, a separate compartment for each hen's eggs so that when the chicks are hatched, the breeding of each individual chick is traceable by reference to the records.

The chicks are then leg banded with small bands, which in about three weeks are taken from the legs. Slits are then made in the wings where the bands are inserted and sealed. These wing bands remain on the birds throughout life so that in case the adult leg bands, which are put on when the birds go into winter quarters, are lost, these wing bands will identify the birds.

For the recording of the work, various forms are used, viz., Monthly Egg Records, Mating, Hatching and Chick Records. These all lead up to, and are incorporated in, the Egg and Breeding Records, on the reverse side of which is given the pedigree and photographic record, so that this latter form contains all the required information of the individual bird.

While progress is of necessity slow, considerable advancement is being made. For instance there was a strong feeling that high egg laying records could not be made in the Prairie Provinces owing to the severity of the weather. It has been demonstrated that this is not so. At the Indian Head Farm some good records have been made. One White Wyandotte pullet, "Prairie Queen," laid 259 eggs in a year. At the Lethbridge Farm where Barred Plymouth Rocks are kept, there have been very high averages and there will be some good individual records made this year.

The most noteworthy pedigreed records to date are those made at the Experimental Station at Sidney, Vancouver island, where the White Wyandotte, "Island Queen," with a record of 261 eggs in her pullet year, has produced the following six daughters that have given good records: "Island Princess," 274 eggs, "Princess Victoria," 300 eggs, "Princess Royal," 291 eggs, "Princess Ena," 243 eggs, "Princess Alice," 201 eggs; and "Princess Mary," 214 eggs. The average production for the six sisters

11 GEORGE V, A. 1921

was 254 eggs. As "Princess Victoria" is the first 300-egg hen produced on the Experimental Farm System her egg record is given in full to illustrate her performance throughout the year.

Space will not permit going fully into the details of the breeding work, but on application to this division, it will be gladly furnished.

VARIETY—WHITE WYANDOTTE. HATCHED—APRIL 28, 1918. CHICK BAND No. 86.
OUT OF MATING B-2. ADULT BAND No. 279.

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Totals		
November.	1	1	1		1	1	1	1	1		1	1		1	1	1	1		1	1	1		1	1	1		1	1	1			23		
December	1	1	1	1		1	1	1	1		1	1	1		1	1	1	1	1		1		1	1			1	1	1	1	1	24		
January.....	1	1			1	1	1	1	1	1	1	1		1		1	1	1	1	1	1			1	1	1		1	1	1		23		
February...		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1				24	94	
March...	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	28		
April.....	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1		28		
May.....	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	N	B						O		N	1	1	1	1		19	75	
June	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30		
July.....	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	28		
August.....	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1		1	1	1		1	1	1		1	1	25	83	
September..	1	1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1		1	1	1	1		1	1	1	1	1		26		
October.....	1	1		1	1		1	1		1	1	1		1	1	1		1	1		1	1		1	1		1	1		1	1		22	48
Total.....																																	300	

Body Weight 5 lb. 5 oz. Egg Colour, Tinted. Egg Weight 25 oz. B-Broody. N. On Nest.

DISEASE INVESTIGATION.

The work undertaken by Dr. A. B. Wickware in relation to poultry diseases is progressing favourably. Experiments are being conducted on avian tuberculosis, to determine, if possible, its exact relation to the types of this disease to be found in the domesticated animals. These are in the nature of sensitization experiments which will be reported on later.

The life-history of certain parasites and mites such as those causing scaly leg is being worked out. A flock is being kept under observation at the Biological Laboratory. The study of the life-history of these poultry parasites involves the length of time necessary for the infection to show up in contact fowls, the degree of infection and the longevity of the parasites in infected quarters.

Study and experiments are also being conducted on chicken-pox to determine the efficiency of different vaccines in the treatment and prevention of pox, canker, roup, etc.

A collection of internal worms such as tape-worms, round worms, etc., is being made to determine the particular species of worm found in Canada and the locality peculiar to certain types.

The problems to which attention is directed and concerning which more work is contemplated may be summed up as follows.—

- (1) A complete study of the conditions known as contagious epithelioma or chicken-pox, roup, canker, swelled head, etc. These affections which are now considered to be only different manifestations of one and the same disease are very prevalent throughout Canada and occasion serious losses not only by a large mortality rate but by decreased egg production in slightly affected fowls.
- (2) Leg weakness or transient paralysis of fowls, which is also very common and usually affects the best layers thus reducing the egg yield to a minimum.
- (3) Tuberculosis of fowls, which annually accounts for large numbers of deaths and for the eradication of which comparatively nothing is being done. This disorder is

SESSIONAL PAPER No. 16

prevalent throughout Eastern Canada and from the numerous inquiries received appears to be firmly established in all the Prairie Provinces.

(4) Parasitic infections, including internal and external parasites. A complete survey, relating to distribution, life histories, etc., is urgently required.

(5) Entero-Hepatitis or blackhead in turkeys. This disease is making big inroads and rapidly depleting the flocks at present in Canada. So far, no progress has been made in combating this affection and comparatively little is known as to the cause, means of transmission, etc.

This list might be largely supplemented by chick diseases, keel in ducks, etc., but only a few of the disorders of mature fowls are herewith tabulated.

CHEMICAL INVESTIGATION

In March, 1919, Mr. R. L. Dorrance, of the Chemistry Division, was detailed by the Dominion Chemist to devote his time to chemical research for this division.

Mammoth Incubator.—At that time, a 10,000-egg mammoth incubator which had recently been installed was not giving satisfactory results, and this was the first subject of investigation. It was suggested that the fault lay in lack of ventilation in the cellar, the exhausted air from the machine remaining in the cellar, and being drawn into the machine causing such a concentration of carbon dioxide gas in the machine, that the developing embryos were smothered. A number of determinations of the moisture and carbon dioxide content of the air in the incubator were made, and these compared with the results of readings made on a 150-egg Cypher's and a 400-egg Buckeye. These two incubators, both of which were giving satisfactory results at the time the test was made, are lamp machines, the former being a hot-air machine and the latter a hot-water machine. The results of these determinations as well as a short resumé of work done by previous investigators was reported at the close of the incubating season. The average moisture content of the 10,000-egg machine was found to be 0.602 per cent as compared with 0.910 per cent in the 150-egg Cypher's and 0.896 per cent in the 400-egg Buckeye. The average carbon dioxide content was 0.266 per cent in the 10,000-egg incubator while in the 150-egg Cypher's it was 0.252 per cent and 0.206 per cent in the 400-egg Buckeye. The air in the room was found to have a moisture content almost identical with that of the 10,000-egg machine and a lower carbon dioxide content, 0.192 per cent. Basing a conclusion on these data, it would seem that the poor results from the 10,000-egg machine were due not to an excess of carbon dioxide but possibly to a low humidity.

The results obtained from the investigation, from a study of the works of previous investigators and from the experience of the average poultryman showed quite clearly that there was a great need for further work on this subject. To that end, an experimental incubator was designed and built.

Eggs.—A start was made on the physical and chemical characteristics of eggs. Up to date about 150 eggs have been measured and weighed, their columns calculated and the specific gravity determined. One dozen eggs from each of the breeds kept by this division, viz., Barred Plymouth Rocks, White Leghorns and White Wyandottes, were analysed to determine if there is any chemical and hence nutritional difference in the eggs of the different breeds. The results showed little or no difference. It seems quite probable that there is as much difference in eggs from individual hens of the same breed as in the average of a number of eggs from hens of different breeds. The average physical characteristics and chemical composition of hen's eggs were found to be as follows:—

PHYSICAL CHARACTERISTICS.

Length...	5.55	cms.	Per cent shell...	14.01
Breadth ..	4.02	cms.	" white..	53.59
Weight in air ..	51.7991	gms.	" yolk...	32.40
Sp. Gr...	1.079			

11 GEORGE V, A. 1921

CHEMICAL COMPOSITION OF HEN'S EGGS.

Shell or refuse.. . . .	14.01 per cent.
Moisture.. . . .	63.47 "
Protein.. . . .	10.87 "
Fat.. . . .	10.70 "
Ash.. . . .	0.88 "
	99.74 per cent.

CHEMICAL COMPOSITION OF WHITE, YOLK AND EGG PORTION OF EGGS

Composition of White	PERCENT	Yolk PERCENT	Eggible Portion PERCENT
Moisture.. . . .	89.02	48.66	73.81
Protein.. . . .	9.31	17.16	12.64
Fat.. . . .	0.28	32.22	12.31
Ash.. . . .	0.40	1.7	0.92
	99.79	99.7	99.68

Chick Feeding.—During the months of July and August some experimental work in chick feeding was carried on. Twelve pens each comprising 44 chicks, as nearly alike as possible, were fed on different rations for five weeks. Pen No. 1, fed wholly on cracked grain as a scratch feed and ground grains as a mash with water to drink, made the lowest gain, 1.67 ounces, and suffered the highest mortality, 31, in the five-week period. Pen No. 11, fed on cracked grain in the litter for scratch feed and a mash consisting of ground grain to which boiled egg and meat meal were added with a supply of green feed and milk to drink, made the best gain, 5.85 ounces, and thirty-five birds were alive at the end of the test. A study of the results from the different pens showed that eggs, meat meal and greens are essential for proper vitality and development, and of these, eggs played a very prominent part.

Further chemical research work is being conducted on incubation, brooding, feeds, nutrition, the value of eggs and poultry in the diet, etc., the results of which will be reported as the work progresses.

EXTENSION WORK

Under this department comes such work as "Exhibitions," "The Farm Egg and Poultry Account," "Survey Work," "Judging," "Institute Work," and the work conducted by the poultry inspector for the Maritime Provinces.

Exhibitions.—During the year the Poultry Division has contributed to all the exhibits made by the Extension and Publicity Division throughout the Dominion, and in addition to this, a special poultry exhibit under the supervision of Mr. W. T. Scott, covered a circuit of eleven fairs in Ontario during November, December, and January.

The exhibit was an arrangement of coloured transparencies of different varieties of fowl, poultry houses, etc., with appropriate legends, a number of models of the best type of house or farm or back-yard and a good display of feeds in glass frames. A representative trio of live fowl of the most popular utility breeds was included, with their distinctive merits plainly lettered on the coops.

The exhibit has been received with great enthusiasm by the officials of the local associations and the general public. The interest shown and the apparent desire for information have been gratifying, and a number of letters of congratulation have been received by the division, and many requests for the return of the exhibit at some future date.

There is no better method than this of getting in direct touch with the right person. In some instances, where advice is sought, the work has been followed up by a visit to the farm of the applicant and practical help and advice given.

SESSIONAL PAPER No. 16

Farm Egg and Poultry Account.—This is a simple form for the purpose of supplying a convenient method of keeping accounts in the poultry plant.

One of the troubles in poultry keeping is the lack of business methods. Few pretend to keep any accounts of the expenditures and receipts, and as a result, poultry profits are more or less in doubt.

To offer a simple method of keeping accounts and to prove that a well managed flock is a paying investment, these account forms were distributed to those who would return a copy each month.

The advantage is mutual. Better methods have been adopted. Figures as to profit and loss are available. The Division obtained a good deal of useful information as to markets, feeds generally available, prices, and the outlook in the locality for the poultry industry. In return the farmer received the free blank forms, seasonable advice and replies to questions on feed and management.

The popularity and usefulness of the work were evident by the number of requests for the blanks, and though there is a good deal of correspondence and tabulating work involved, it is considered of great value to the correspondent and to the Division.

The information given in the following table as well as other data, was extracted from the reports sent in:—

SECTIONAL AVERAGES PER FARM, FEED, ETC.

Province or Provinces	Average number of hens per farm	Average cost of feed and appliances per hen	Average profit over expenditure per hen	Percentage of farms profitable
Quebec.....	52.9	\$2.46	\$2.30	82.0
Maritime Provinces.....	34.8	3.48	11.92	82.3
Ontario.....	38.9	2.32	1.63	82.6
Prairie Provinces.....	54.6	2.55	2.82	88.0
British Columbia.....	83.6	3.75	1.54	87.5
Average.....	52.9	2.91	2.04	84.5

* The most pleasing feature of the table is that the great majority of the flocks show a profit, and that the profits are substantial, considering the outlay.

Survey Work.—Mr. R. Dumaine has continued the work started in Quebec from the Experimental Farms, and in addition to this he has acted as Inspector over similar work conducted at four centres by the Provincial Department. This inspection requires a visit to 115 competitors once every three months. He has also attended a large number of institute meetings and has assisted at the short courses conducted in that province. During the show season he also judged poultry at a number of fairs.

At the request of the Provincial Department he organized the first poultry association in lower Quebec. This association had its first poultry show at Ste. Anne de la Pocatière, March 21, where nearly three hundred birds were exhibited.

The demand for his services in the province has been such that the bulk of his time is taken up at this work and even then he cannot fill all the requests for assistance.

Inspection.—Something similar to the survey work conducted among the farmers surrounding the Experimental Stations in Quebec was the inspection work this year started in the Maritime Provinces by Mr. J. G. Morgan.

In addition to the survey work from the Experimental Farms, his duties included assistance and advice to the poultrymen in charge of the work at the Farms, demonstrations and lectures at the Farms, speaking at Institute meetings, judging and demonstrating at fairs, the inspection of the laying contests conducted by the Experimental Farms at Charlottetown, Nappan, and Cap Rouge, and the inspection of the contest at Truro under the management of the Provincial Department of Nova Scotia.

EGG LAYING CONTESTS AND RECORD OF PERFORMANCE

The establishment of a Record of Performance for poultry which was instituted from the first of November, 1919, marks an advanced step in poultry keeping. At the present time, Record of Performance is divided into two sections, Section A and Section AA. Section A is the inspection of trap-nested flocks on the farmers' own premises, which comes under the supervision of the Poultry Division of the Live Stock Branch. Section AA is the trap-nesting of the birds in laying contests which are conducted by this Division.

The egg-laying contests conducted in 1919-20, with the number of birds and the locality, is given in the following table:—

EGG-LAYING CONTESTS, 1919-20.

Name	No. Birds	Location
Canadian egg-laying contest.....	500	Ottawa
Prince Edward Island egg-laying contest.....	220	Charlottetown
Nova Scotia Federal egg-laying contest.....	200	Nappan
Quebec egg-laying contest.....	200	Cap Rouge
Manitoba egg-laying contest.....	200	Brandon
Saskatchewan egg-laying contest.....	190	Indian Head
Alberta egg-laying contest.....	120	Lethbridge

This work has created considerable interest, and with the adoption of registration Record of Performance will be an established medium which will do away with the uncertainty of individual records, and will make it possible for the buyer to know what he is paying for.

BULLETINS AND CORRESPONDENCE

A number of the exhibition circulars are being re-written, one new bulletin, No. 91, "Poultry Feeds and Feeding," by George Robertson, was published during the year. Bulletin No. 87, on "Poultry House Construction," is exhausted and is being re-written.

The demand for poultry literature has considerably increased during the last year or two, as has also the correspondence.

SESSIONAL PAPER No. 16

TOBACCO DIVISION

REPORT OF THE CHIEF OFFICER, F. CHARLAN

The growing season of 1919 was notable for a period of drouth lasting from early in June until the middle of July. During this time the temperature was high, which brought on the seedlings rapidly and gave a supply ready for transplanting at an early date but the drouth made the work in transplanting very difficult. Growth was slow during the dry period and the plantations did not commence to grow vigorously until the end of July. The yields, however, were a good average in Ontario but in Quebec they were below the normal.

The high price paid for the 1918 crop led to an increased area being planted with tobacco both in Quebec and Ontario. The harvest in Quebec was one of the greatest obtained up to the present, especially in the districts north of the St. Lawrence. In Ontario a notable increase in the area planted to yellow flue-cured tobacco was noted, and especially an increase in the area under White Burley. In 1918 the burley harvest was estimated to be about seven million pounds, while in 1919 it rose to about twelve million pounds.

The prices paid for Canadian tobacco, especially Ontario grown, in the course the fall of 1919 were the highest ever yet obtained. The average price of good quality burley was 40 cents per pound, while the price paid for yellow flue-cured tobacco was about 60 cents per pound. Certain lots of Comstock Spanish grown in the province of Quebec were sold at 50 cents per pound but this price was not paid for a great deal of the crop.

While the Ontario tobaccos were absorbed by the market very rapidly, in the course of a very few days, the tobaccos grown in Quebec were bought much more carefully and slowly and during the winter no buyers were found willing to offer 40 cents per pound, although the demand of manufacturers for Canadian binders was still far from being satisfied. This can only be explained by the fact that many plantations of Comstock Spanish did not reach a sufficient development to furnish a good proportion of leaves suitable for wrappers. The buyers also felt that the area planted to tobacco had been so increased last year that they would have no difficulty in getting the quantity they required.

The curing of the crop of 1919 was carried out under very favourable conditions both in Ontario and Quebec. Speaking generally, the colour of the burley was brighter than in 1918 or 1917. The Quebec harvest contained a much smaller percentage of mildew than has been usual so that, although the produce was a little lacking in development, one may say that the crop as cured was in the best condition of anything produced for many years in that section of Canada.

EXPERIMENTAL STATION, HARROW, ONT.

The season of 1919 commenced very favourably. The seedlings did particularly well, which permitted of a large distribution among the tobacco growers in the district, many of whom had not been very successful with their seed beds.

As usual, the seed beds on the Experimental Station were steam treated in order to disinfect the soil. Series of experiments were continued from the previous year in order to demonstrate more fully the results so far obtained. It was again demonstrated that the semi-hotbed under glass is the best for this district. It requires more manipulation and watchfulness than the hotbed but it is more readily available for the majority of tobacco growers.

11 GEORGE V, A. 1921

Disinfection of the seed bed by steam was found to be done thoroughly in thirty minutes if a boiler furnishing a pressure of 100 pounds be used. At first glance one might think that the soil could be disinfected by steam at a lower pressure by lengthening the process but it was found in such a case the great condensation of the steam moistened the soil so much that it caused a great deal of trouble. As far as final result goes, it would seem immaterial whether the soil be disinfected in the autumn or early in the spring. However, when a large area is to be put into crop it is better to commence the sterilization in the autumn in order to be more independent of spring weather conditions.

The sowing of dry tobacco seed gave better results than sowing the seed after it had been sprouted.

As to the plantation itself it was again shown that the complete preparation of the soil the previous autumn is one of the most important factors of success. In every case the plots prepared in the autumn gave a more profitable crop than those prepared in the spring, to say nothing of the fact that insect damage was much less on those plots prepared in the fall. Moreover, in nearly all cases the work can be done more cheaply in the fall than in the spring.

An experiment was carried on with chemical fertilizers. The effect of distributing the fertilizer with the seed drill as compared with spreading broadcast was studied. Sowing with the drill gave a better result than the broadcast method which may be explained possibly by the long drouth in 1919. The results will be further verified.

An experiment in transplanting at different distances apart, using each of the principal varieties of tobacco grown at Harrow, showed that the best results were obtained from planting at the following distances:—

Burley Broad Leaf..	44 inches by 28 inches.
Burley Stand-up..	42 " " 26 "
Flue-cured..	36 " " 24 "

These distances may be recommended for the Burley. As to the flue-cured the distances may be slightly increased on light soil but on the Harrow Station it has been found necessary to plant a little more closely in order to avoid the production of tobacco a little too thick-leaved. The methods already recommended to combat the grey worm and horned caterpillar have been as effectual in 1919 as in preceding years. Diseases of the tobacco plants were less frequent in 1919 owing to the drouth. Tobacco root rot (*Thielavia Basicola*) spreads especially during moist seasons and on land not sufficiently drained or in soils containing a high percentage of clay.

As to harvesting, the practice of splitting the stem of the White Burley plants before putting them in the curing barn is to be recommended highly. This may be done without an increase in the cost, the drying of the plant is much more rapid and consequently the leaves are a better colour and a minimum amount of damage is incurred. The tests or varieties of yellow flue-cured tobacco carried on with a view to determining those best suited to Ontario, has indicated the following as being among the best: Warne, Hickory Pryor, Flanagan, Granville County Yellow, Adcock, Willow Leaf, Rich Wonder. Of all these varieties the best are the Warne and the Hickory Pryor. The Warne has been already established in Ontario for a long time and the growing of Hickory Pryor is spreading more and more. Under good conditions it is easy to obtain a yield from the Hickory Pryor quite as abundant as from the Warne accompanied by just as good colour and a better lustre.

The principal varieties of Burley tried in 1919 were the following:—

- 1 selection of Burley Broad Leaf;
- 1 selection of Burley Stand-up,
- 2 selections of Burley Resistant.

Burley Resistant and Stand-up show themselves much earlier than the Burley Broad Leaf and on the whole gave a brighter coloured crop. One of the Burley

SESSIONAL PAPER No. 16

Resistants gave the heaviest yield followed by the Burley Broad Leaf and the Burley Stand-up.

The varieties of tobacco for nicotine production seemed affected by the drouth early in the season and gave only very little yields.

The tests of commercial fertilizers carried on in 1919 indicated that for air-cured tobacco the following formula might be recommended:—

Sulphate of ammonia.. . . .	180 pounds per acre.
Superphosphate.. . . .	600 " "
Sulphate of potash.. . . .	200 " "

and for the Burleys:

Sulphate of ammonia.. . . .	400 pounds per acre.
Superphosphate	400 " "
Sulphate of potash.. . . .	170 " "

In the case of the burleys some plots had received 12 tons of barnyard manure per acre, while the flue-cured tobacco plots had received no manure at all.

The advantages of using acclimatized seed over imported seed were again confirmed this year.

EXPERIMENTAL STATION, FARNHAM, QUE.

The seedlings at the Farnham Station were produced in semi-hotbeds without manure after the method recommended by this division for some years. Dry tobacco was used in sowing these beds. There was an abundance of seedlings produced although many planters in the district had poor success with their seed beds, the result most certainly of not following our advice to sow thinly using only about 1/7 of an ounce of good seed to 100 square feet of bed. Thinly sown seed beds well ventilated, even under the somewhat rigorous climatic conditions of the Province of Quebec are the first requisites for success. In taking into consideration the care given to the making of the seed beds and attending to them, it was found possible to produce seedlings at a price of about \$1.50 per thousand. Even this price may be somewhat cut down. The plantation was carried on rapidly from the 3rd to the 13th of June during very warm weather. The nights, however, were chilly which aided in the establishment of the plants and reduced the number of replacements to the minimum of some two or three per cent. Injury from insects was very small indeed and it was not found necessary to use insecticides against the cutworm. The wire worm, however, gave some trouble, making it necessary to replace from 5 to 7 per cent of the plants.

The varieties grown at Farnham in 1919 were the following:—

A selection of Cuban.

A selection of San Felix.

Two selections of Yamaska, No. 1095-4 and No. 2011.

Growth was slow during the latter part of June and especially slow during July, which was very dry and rather cold, but in August, conditions improved very rapidly. Light but frequent showers enabled the plants to develop very completely. The crop was harvested before September 15th.

For the first time there was obtained from a selection of Cuban grown in Canada a satisfactory weight of crop. The average shows good plots going above 1,000 pounds per acre. As to the Brazil, which was especially studied with a view to the production of aromatic plant, the yield was less encouraging, scarcely coming up to 1,150 pounds per acre. The Yamaska No. 1095-4 gave 1,400 pounds. The Yamaska No. 2011 gave over 1,600 pounds. Under these conditions the growing of the last-named might prove profitable, in spite of the fact that the proportion of leaves large enough for wrappers is not as great as in the case of the Comstock Spanish. The great difficulty found with the Yamaska on the plantation is the fragility of the leaf and its rapidity of ripening. This latter feature makes it necessary to gather the crop very quickly if loss is to be avoided.

11 GEORGE V, A. 1921

Tests of Commercial Fertilizers.

A very complete test of commercial fertilizers was carried on in 1919, covering 30 plots. These had been manured in the autumn of 1918 at the rate of eight or nine tons per acre. On the plots, besides the commercial fertilizers generally employed, the tobacco grower tried ground bone, linseed meal, cotton-seed meal, fish scrap and tobacco stems. Twelve of the plots were treated with ground limestone, slack-lime and quick-lime. In every case the use of the fertilizer showed a profit. The lime, taken altogether, did not show the results we had expected.

Tobacco Diseases.

The effort to control and eradicate the root rot in tobacco (*Thielavia Basicola*) undertaken under the direction of the Tobacco Division was continued, and up to the present, the disinfection of the soil of the seed beds, either by steam or formalin, and the adoption of rotations not including plants on the roots of which the *Thielavia basicola* can flourish, are the only methods which have been found effective. It is hoped to publish shortly the results of the experiments carried on during the last four years in this direction.

As to mosaic, as well as to tobacco root rot, certain varieties have shown themselves particularly resistant, while others have been shown themselves especially liable to it. This seems to indicate the possibility of isolating strains of tobacco resistant to the disease. At any rate, an attempt will be made in this direction.

The work of selection of a type or types of White Burley resistant to root rot made good progress during the year. On the Harrow Station we were able to isolate, in using seed furnished by Mr. Johnson, of the Experimental Station of Wisconsin, a strain of White Burley Resistant which gave a yield equal to that of the ordinary Burley Broad Leaf. It also seems that there is good hope of obtaining the same result with a White Burley cross coming from a cross of White Burley with a variety of tobacco naturally resistant to this disease.

Co-operative Work with Fertilizers

This work carried on in co-operation with a certain number of Ontario tobacco growers was continued in 1919. It has been found to be one of the best means of teaching the method of using commercial fertilizers. In every case the results have been most favourable. The weight of the crop has been considerably increased and also the money yield therefrom.

This co-operative work was conducted on a still wider basis by the Superintendent of the Farnham Tobacco Station and the same favourable results were obtained. It is hoped to publish the results of this work in the near future.

A test of lime was carried out on an acid soil but it did not give the results expected. One might have hoped at least on a soil rich in humus for a marked increase in weight of crop and better development of the plant, but neither result was obtained in 1919.

The study of tobacco soils in Canada was continued as far as time would permit. From the work so far done it is now hoped to be able to judge fairly closely the kind of soil best suited to each of the types of tobacco grown in Canada.

The examination of the soils of Norfolk, Ont., indicates that this district is sure to become a very important tobacco growing centre which will be able to specialize in the production of yellow flue-cured tobacco of the Virginia type. As in previous years the Tobacco Division gathered statistics as to the total crop grown in Ontario. The production of Yellow Virginia type amounted to some one million five hundred thousand pounds and about ten million of White Burley was grown.

SESSIONAL PAPER No. 16

CENTRAL EXPERIMENTAL FARM, OTTAWA

The experimental area at the Central Farm was devoted in 1919 to the production of seed of Comstock Spanish, Canelle, and Little Havana. A special endeavour was made to prepare for the expected increase in demand for seed of Comstock Spanish, owing to the high price paid for tobacco of this variety during the preceding year. The harvest of seed was good as a whole, in spite of the fact that growth had been considerably held back by the drouth and cold nights of the month of June.

WAREHOUSE

As heretofore the tobaccos grown on the Quebec Farm and the Central Farm were all treated in the warehouse at Ottawa. Some difficulty was experienced owing to lack of help but the work was carried on without special incident. The fermentation of Yamaska of Farnham was particularly successful. The Brazil did not give quite so good results. The curing of these tobaccos was unsatisfactory and their fermentation was difficult. It is very likely that this arose from the presence of a disease affecting the leaf tissues but which had not been noticed during the growing season.

DIVISION OF BEES

REPORT OF THE APIARIST, F. W. L. SLADEN

The work of the Bee Division during the year may be divided into (1) General Work, (2) Special Experiments.

Under General Work is included the maintenance of the Central Farm apiary at Ottawa, a summer out-apiary in connection therewith, and apiaries at fifteen of the Branch Farms; correspondence; interviewing and giving advice to visitors; cooperative experiments with private beekeepers in certain little-known and promising localities; the issue of press articles on timely subjects giving the results of experiments; exhibition work, etc.

The season of 1919 was favourable for the production of clover honey at the Central Experimental Farm, where from 38 colonies there was an average production of 200 pounds to the colony, bringing the annual average production per colony during the last seven years up to 134 pounds.

Lethbridge produced an equivalent of 213 pounds to the colony, mainly from alfalfa, bringing the average annual production for the past six years up to 99 pounds. Other Branch Farms that scored high yields in 1919 were Invermere, B.C., 127 pounds to the colony; Kentville, N.S., 122 pounds to the colony; and Sidney, B.C., 109 pounds to the colony.

Under Special Experiments are included several promising lines of investigation that have been singled out for progressive work.

1. Management experiments: particularly the study of methods of (a) reducing the labour incidental to controlling swarming, and (b) increasing honey production by utilizing the very favourable conditions for breeding up in the spring in many parts of Canada (particularly at Ottawa, where the chief experiments were carried on). A system of management that was devised in 1918 was tested and further developed and was found to reduce labour and increase the number of bees raised to work on the clover so that a larger return of honey was obtained per colony with less labour than by the methods generally employed.

11 GEORGE V, A. 1921

2. A breeding experiment. In July, queens and drones were taken in sixteen hives to Duck island, at the eastern end of lake Ontario, where complete isolation for mating purposes was found to exist. The results have been of considerable scientific interest and have indicated that this is likely to be a satisfactory place for studying isolated mating which appears to be essential for the maintenance of any definite work in breeding bees for improvement.

3. Investigation of northern conditions at the Experimental Station at Kapuskasing, Ont. As a result of preliminary experiments with bees at Kapuskasing made by the writer during July, 1918, two colonies were sent there from Ottawa early in August, 1919. When visited on September 11 and 12, it was found that they were doing very well, having gathered a large quantity of honey from alsike and white clover, fireweed, and *Aster macrophyllus*. Plans were made for extending the bee experiment work here.

4. An experiment to ascertain the actual value of honey bees in the production of apples in Nova Scotia has been undertaken at the Experimental Station at Kentville. By request, an address was given on this subject at the Annual Convention of the Nova Scotia Fruit Growers' Association, held at Kentville in January.

DIVISION OF ECONOMIC FIBRE PRODUCTION

REPORT OF THE FIBRE SPECIALIST, R. J. HUTCHINSON

Owing to the necessity of devoting a very large proportion of time to the production of "pure line seed" in a commercial way, the division found it impossible to proceed with much of its usual work.

Variety Tests.—During the year a total of eleven acres, including seven varieties of seed, were tested at the Central Experimental Farm:

The following table will show the average yield per acre of scutched fibre:—

Variety of seed	Germination of seed	Plot	Yield of scutched fibre	Grades
Long Stem	95	1-10 of an acre	468 pounds	No. 3
Ontario Dutch Child	94	1-10 of an acre	344 pounds	No. 3
Imported Dutch	91	1-10 of an acre	406½ pounds	No. 1
Indian Head Long Stem	93	1-10 of an acre	204 pounds	No. 4
Japanese Siberian	95	1-10 of an acre	307 pounds	No. 2
Dutch White Flowering	97	1-10 of an acre	364 pounds	No. 1
Imported English	82	1-10 of an acre	214 pounds	No. 5

From the striking uniformity of the flax straw produced from each of the pure line seeds as compared with that grown from any of the commercial varieties, and from the results of the trials, it is certainly evident that the flax crop can be greatly improved, through the propagation of pure line seed from selected plants.

Flax Tests.—Approximately nineteen acres of flax in plots ranging from one-tenth to one acre in size, were grown in different districts throughout Canada. Owing to the dry spell, during the growing season, the flax was so extremely short as to render it useless for scutching purposes.

SESSIONAL PAPER No. 16

Prairie Flax Straw.—The experiments to determine the possibilities of recovering and utilizing the straw from flax grown for seed production have been completed. The fibre obtained was chemically treated in specially prepared vats by a fermentative process, which required only a few hours. After thus being treated the fibre was shipped to Doon Twines, Limited, Kitchener, Ont., where it was carded and manufactured into binder twine.

The twine has not been tested sufficiently under field conditions to justify a pronounced statement. It was approximately two lea yarn, twisted four-ply, running about 650 feet to the pound. Commercial twine and rope were also made, but no conclusions regarding their value have been established.

The waste material from the carding operations was found useful for felting purposes, and when mixed with 20 per cent of cow hair, it can be used for insulation. The binder twine was manufactured at a cost of approximately 13½ cents per pound and the commercial twines at 20½ cents per pound.

Seed Inspection.—In order to safeguard the export trade to Ireland, through the maintenance of a uniform standard of high quality seed, the Federal Department of Agriculture made provision for an inspection and grading service for the flax seed crop of 1919. It may be expected that for years to come Ontario seed will come into keen competition with Japanese, Dutch and Russian seeds, and unless Ontario can insure the Irish trade with the quality of seed that will compare at least favourably with that from other countries mentioned, it will be much handicapped in maintaining a market.

Flax Scutching.—Bad scutching not only lowers the value of the flax, but increases the output of tow. The whole aim in flax production is to obtain a maximum of flax fibre with a minimum of tow.

A new method of flax scutching which has been put into operation, and which is suitable for Canadian conditions, is for the scutchers to work in pairs at adjoining stocks. One is the learner doing the rough scutching (which is called buffing) and then passing the head of flax to the skilled worker, who completes the final cleaning.

Grading.—The system of flax grading, which was started in the year 1918 is working very satisfactorily.

Flax Pulling Machines.—Several commercial flax pulling machines have been made of different designs. At least one machine of Canadian invention, of the belt pulling type, has been proven in various trials to be a commercial success.

With the approval of the Director, Experimental Farms, ten weeks were spent in various parts of the flax growing districts in Ireland to investigate the seed and fibre market.

DIVISION OF CHEMISTRY

REPORT OF THE DOMINION CHEMIST,

FRANK T. SHUTT, M.A., D.Sc., F.I.C.

EDUCATIONAL AND ADVISORY WORK

It may be regarded as an encouraging and hopeful sign for the future of Canadian agriculture that our farmers year by year in increasing numbers are educating themselves in the principles which underlie economic and rational farming. One means of so doing is by taking advantage of the offer of information and advice, in matters in which the science of chemistry can render assistance—in the treatment of various

SESSIONAL PAPER No. 16

EXAMINATION OF SOILS FOR FARMERS

Soil samples, in considerable numbers, have been sent in by farmers from many widely distant points in the Dominion. Without submitting these to complete analysis, which, in the majority of instances, would be quite unnecessary, a sufficiency of chemical and physical work is done upon them to determine their nature and condition to permit of a report of a suggestive and helpful character as to their treatment. The chief points upon which information is furnished in connection with this work are drainage, cultivation, manures and fertilizers, liming, alkali content and suitable crops.

As certain information respecting present drainage, the history of the soil as to past cropping and manuring, etc., is necessary to the satisfactory interpretation of our results, a special "form" giving directions as to the collection of the sample and containing questions to be answered by the sender on the above mentioned matters, is issued. The form is obtainable free upon application to the Division.

INVESTIGATIONAL WORK WITH FERTILIZERS

Experimental work with fertilizers has been carried on during the season of 1919, on the Farms and Stations of the System, as follows: Charlottetown, P.E.I., Kentville, N.S., Fredericton, N.B., Cap Rouge, Que., Ottawa, Ont., Brandon, Man., Indian Head, Sask., Lacombe, Alta., Invermere and Summerland, B.C.

Experiment Plan "E".—The details of this plan were given in our report of last year; it may therefore be only necessary to state that this scheme has for its primary object the determination of the most profitable combination and quantity of a fertilizer mixture throughout a three-year-crop rotation consisting of: 1st year, hoed crop; 2nd year, grain; 3rd year, hay.

This experiment is of a comprehensive character, permitting the study of the influence of nitrogen, phosphoric acid and potash, as furnished by fertilizer materials, separately and in several combinations and proportions. It also includes the application of barnyard manure, alone and with fertilizers, and the effect of liming. The plan calls for from 60 to 75 plots and was commenced in 1918 at Charlottetown, P.E.I., Kentville, N.S., Fredericton, N.B., Cap Rouge, Que., and Agassiz, B.C. The season of 1919 constitutes the second in the rotation.

Any detailed statement of the results of the season obtained at the several points of experiment would be too voluminous for this report and, further, general deductions must be left until the rotation is completed, but certain inferences at this stage appear warrantable.

The fertilizer and manure applications were made in the first year of the rotation, on the hoed crop. On certain of the plots in the second year (grain) a dressing of nitrate of soda was given. In the majority of instances these latter plots gave a decidedly larger yield of grain and straw, as compared with those which did not receive nitrate. The conclusion seems warranted that on poor soils an application at seeding time of nitrate of soda, say of 100 to 150 pounds per acre, for grain will be a profitable practice.

It is also evident from a study of the results that a complete fertilizer, i.e., one containing nitrogen, phosphoric acid and potash, will give on most cultivated soils which are not in a high state of fertility, a larger and more remunerative yield than one containing any single element of plant food.

Further, it is apparent that for the most profitable results, the soil, especially if it be poor in humus, must receive some manure. Fertilizers are much more effective and profitable if associated with manure applications than when used alone, and it may also be stated, more profitable returns have been obtained in a large number of cases from this plan than from heavy manurial dressings without fertilizers.

11 GEORGE V, A. 1921

In the Maritime provinces generally and in Quebec the influence of liming has been marked. As an example the results obtained at Kentville, N.S., may be cited:—

Hay—

Average of limed plots..	4,786 pounds per acre.
Average of unlimed plots..	3,045 " "
Largest yield of limed plots..	5,070 " "
Largest yield of unlimed plots..	3,080 " "

There is much additional evidence to show that many lands in Eastern Canada may be profitably treated with lime or ground limestone.

Influence of Phosphoric Acid on Yield and Maturity.—The influence of phosphoric acid (100 pounds of superphosphate per acre) on the yield and date of ripening of corn was tested at Cap Rouge, Que., Brandon, Man., and Indian Head, Sask.

Careful observations failed to reveal any hastening of the maturing of the crop due to the application of superphosphate, and there were no marked increases in yield due to the fertilizer, though as regards the latter statement it should be remarked that the plots at Cap Rouge had received manure at the rate of 20 tons per acre and the soils at Brandon and Indian Head were rich and fertile.

At the Central Farm, Ottawa, an experiment has been in course for the past two years to ascertain the relative values of nitrogen, phosphoric acid and potash as furnished by the several forms on the market. Thus, for nitrogen, nitrate of soda, sulphate of ammonia, cyanamide and dried blood were employed; for phosphoric acid, superphosphate, untreated phosphate rock and basic slag; for potash, muriate of potash, Nebraska potash, nepheline syenite, Drury's potash. The crop used is potatoes and the season was a poor one for large yields.

Many erratic results were obtained, owing to unevenness of soil, and it would therefore be unwise to draw final conclusions, but a few of the more outstanding results may be given with the proviso that they are merely one year's findings and to be considered as tentative only.

The maximum yield in the nitrogen group was obtained from the plot receiving nitrate of soda 115 pounds and dried blood 150 pounds per acre, with superphosphate and muriate of potash.

In the phosphoric acid group, the maximum yield was from the basic slag 685 pounds per acre, with nitrate of soda and muriate of potash.

In the potash group, the maximum yield was from the plot receiving Nebraska potash (sulphate) 200 pounds with nitrate of soda and superphosphate.

The best yields in the whole three series were obtained on the plots receiving nitrogen in one or other of the forms employed, which may be taken as indicating that nitrogen is the limiting element or the element chiefly deficient in the soil of the experimental area.

FERTILIZER MATERIALS AND AMENDMENTS

Limestone.—The wide interest that has been taken in the application of lime compounds, more especially ground limestone, during the past five years may be regarded as indicating a notable step forward in Canadian field husbandry. The evidence that has accumulated, more particularly from Eastern Canada, is most satisfactory and encouraging. We feel assured that it is a practice that is bound to become a permanent feature in our soil treatment, not generally necessary throughout the whole Dominion, but more especially beneficial in districts under humid conditions and in which cultivation and cropping have long been practised on soils naturally poor in lime.

During the year the Division has analysed and reported on a number of limestones, forwarded for the purpose of learning if they were rich enough for the purpose

SESSIONAL PAPER No. 16

of manufacturing ground limestone. The larger number were submitted by the Provincial Department of Agriculture of New Brunswick, and the results, as in previous years, showed that many excellent limestone deposits occur in that province.

ANALYSIS OF LIMESTONES, 1919

Lab- oratory No.	Locality	Mineral Matter insoluble in acid	Oxide of Iron and Alumina	Carbonate of Lime	Carbonate of Magnesia
43491	J. H. Havelock, N.B.....	4.10	0.84	94.79	
45146	A. S. Edgwood, B.C.....	16.54	2.68	78.70	
45252	J. B. Chatham, N.B.....	1.80	1.30	59.89	37.86
45253	J. B. Chatham, N.B.....	4.04	0.80	94.55	
46369	J. G. Edmundston, N.B.....	43.40	6.00	45.04	
47896	A. W. C., Dorchester, N.B.....	10.44	2.24	56.00	30.51
49602	J. H. G., Three Rivers, Que.....	57.10	9.75	25.94	5.45
50080	M.D., Restigouche, N.B.....	49.55	3.09	45.69	
50296	E.P.B., Upper Kent, N.B.....	21.48	2.99	66.09	
50340	E.L., Mont Joli, Que.....	43.03	2.06	50.00	
50433	J.N.B., Nashe's Creek, N.B.....	41.09	1.52	56.30	
50434	J.N.B., Nashe's Creek, N.B.....	1.66	0.31	98.30	
50673	E.L., Mont Joli, Que.....	20.73	1.85	76.50	
44293	A.W.S., Kingston, Ont.....	5.70	2.27	89.02	
46995	G.A.L., Sherbrooke, Que.....	3.42	0.38	94.79	
48248	G.A.L., Quebec, Que.....	0.92	0.78	97.21	
47093	G.A.L., Quebec, Que.....	1.14	1.10	97.32	
47000	G.A.L., Quebec, Que.....	0.76	0.84	98.01	
46230	A.J.A., Okanagan Mission, B.C.....	0.30	0.10	94.05	
46288	A.J.C., Kaslo, B.C.....	3.08	0.90	93.68	
47094	G.A.L., Quebec, Que.....	0.88	1.00	98.21	
47589	G.A.L., Quebec, Que.....	0.64	0.72	98.18	
49638	J.H.G., Three Rivers, Que.....	4.35	1.05	93.62	

The outstanding functions of lime (including the forms slaked lime, ground limestone and marl) may be briefly stated as follows: the correction or neutralization of soil acidity, commonly known as sourness—a property more or less injurious to the growth of most farm crops; the furnishing of an important element of plant food; the improvement of the tilth and structure of many types of soils and especially of heavy clay loams, making them more retentive of moisture, more readily drained and more easily worked and better adapted to the extension of the crop's root system; the promotion of conditions favourable to the development of those microscopic organisms within the soil which play so important a part in the preparation of crop food from inert soil material and by encouraging the growth of clover in adding available nitrogen to the soil from the free and otherwise unavailable store of that element in the atmosphere.

Marl.—Marl is essentially carbonate of lime. It is a form eminently adapted for agricultural use, being soft, friable and easily reduced to a powder when air-dried. Its preparation and application are simple and its results are fully equal to those of ground limestone. As a naturally occurring amendment its value has not yet been fully realized.

Deposits of marl, usually associated with swamp muck, are found in many parts of Canada. As might be expected, it is variable in composition. There are marls in the air-dried condition which contain 90 per cent and over of carbonate of lime, others, due to admixture with clay, organic matter, etc., in which the carbonate of lime content may be from 25 to 50 per cent also occur—hence the value of a chemical analysis.

The larger number of marls analysed during the past year, as will be seen from the following table, were of excellent quality.

ANALYSIS OF MARLS (AIR-DRIED) 1919.

Laboratory No.	Locality	Mineral matter insoluble in acid	Oxide of iron and alumina	Carbonate of lime	Moisture, organic matter, etc. (undetermined)
44316	A.E., Kimberley, B.C.	22.69	2.38	57.67	15.34
43490	P.L., Maple Green, N.B.....	6.44	1.12	80.19	12.25
44605	C.C., Dixville, Que.....	14.80	.....	60.39	24.81
44606	C.C., Dixville, Que.....	2.30	.....	85.38	12.32
44607	C.C., Dixville, Que.....	2.06	.....	86.38	11.56
44608	C.C., Dixville, Que.....	2.40	.....	84.64	12.96
44609	C.C., Dixville, Que.....	1.04	.....	87.12	11.84
44610	C.C., Dixville, Que.....	2.56	.....	83.90	13.54
45463	T.S., Salmon Arm, B.C.	3.46	1.02	89.22	6.30
48722	E.P.B., Fredericton, N.B.	8.85	0.94	81.81	8.40
48723	E.P.B., Fredericton, N.B.	2.55	0.40	86.49	10.56
48963	N.P., Kelowna, B.C.....	0.48	0.10	90.44	8.98
49247	S.B., Benton Landing, B.C.....	7.27	1.50	61.75	29.48
49365	R.H., Apple Hill, Ont.....	6.88	1.13	70.10	21.89
50305	C.J.P., Clinton, B.C.....	9.04	1.19	66.56	20.90
50306	C.J.P., Clinton, B.C.....	10.83	1.63	71.00	14.47
50454	Wm. E., Victoria, B.C.....	5.50	0.50	84.50	9.50
50489	V.C., Maria, Que.....	2.44	0.40	94.00	5.16
50490	H.B., Montreal, Que.....	0.39	0.22	91.00	8.39

Agricultural Lime.—This material is now to be found on the market. It should always be purchased on guaranteed analysis, as a considerable difference in lime content may be met with in the various brands offered for sale. The three samples analysed all showed high percentages of quick lime.

LIME, 1919

Laboratory No.	Manufacturer	Insoluble Residue	Oxide of Iron and Alumina	Carbonate of Lime	Undetermined
46994	Dominion Lime Co.....	1.36	2.54	87.25	1.59.
47092	F. Carnac Marquis.....	0.40	1.94	90.60	
48249	Dominion Lime Co.....	0.32	2.06	81.84	3.28

Tobacco Products.—The waste of by-products of the tobacco factory—dust, stems, etc.—possess a distinct though variable fertilizer and insecticidal value. Potash and nitrogen are their chief elements of plant food and when purchased for manurial purposes an analysis showing the percentages present should be obtained. The poorer materials, e.g. tobacco dust, frequently contain large amounts of sand. The variability in composition and hence the difference in value of these by-products may be observed from the following analyses made during the past year:—

WASTE PRODUCTS FROM THE TOBACCO FACTORY

Laboratory No.		Moisture	Ash	Loss on Ignition	Insoluble Residue	Phosphoric Acid P ₂ O ₅	Potash K ₂ O	Nitrogen
50298	Tobacco dust No. 1.	2.29	76.30	21.41	70.57	0.12	0.65	0.59
50299	Tobacco dust No. 2.	4.25	44.57	51.18	34.75	0.40	1.62	1.39
50300	Tobacco dust No. 3.	3.17	63.44	33.39	55.20	0.19	1.07	0.89
50301	Cigarette Stems.....	7.87	18.53	73.60	0.55	0.63	4.49	1.04
50302	Burley Stems.....	7.03	22.56	70.41	0.38	0.92	7.69	2.89
50303	B. E. Stems.....	7.45	22.57	69.98	0.43	0.52	7.60	1.47
50632	Tobacco Dust	1.97	15.11	78.40	.....	.....	.....	0.43

SESSIONAL PAPER No. 16

Miscellaneous.—Among the various materials having fertilizing value analysed during the year were wood and mill ashes, incinerator ashes, Nebrask potash, California potash, "basic slag with potash", bracken, decayed seaweed, fish wastes, guano, gypsum, "tomato slush" from cannery, mucks, pond and river muds. Many of these natural deposits and waste products have been treated of in previous reports: lack of space unfortunately prevents their detailed discussion here.

CLASSIFICATION OF IRRIGABLE LANDS

The chemical and physical examination of soils in connection with the classification of lands in irrigable areas in southern Alberta and southwestern Saskatchewan, commenced in 1913, has been continued. This work was undertaken for and is reported to the Reclamation Service, Department of the Interior. It has had for its chief object the determination of "alkali" in suspected areas, the data obtained permitting the classification of the lands involved into irrigable and non-irrigable from the standpoint of possible future injury due to rise of alkali under irrigation. During the year 128 soil samples, comprising 32 groups, have been analysed and the areas involved reported on as to suitability for cultivation under irrigation.

Several investigations are being carried on in connection with alkali problems, e.g., the alkali content of soils as related to crop growth, the vertical movement of alkali under the influence of irrigation, etc., and interesting and valuable data thereon have been obtained from the past year's work in field and laboratory.

The detailed analysis of a number of waters from artesian wells in southern Alberta has been made, with a view of determining the suitability of these waters for irrigation, provided they were in sufficient volume in any case to permit of their employment for this purpose. Our report shows that the waters examined were all more or less saline and not safe or suitable for irrigation, though in limited quantities and occasionally applied, certain of them might be used for a time on soils with good drainage without marked injury.

The most recent phase of our work for this branch of the Department of the Interior has been the examination of soils from areas in the northwestern provinces under consideration for reclamation by drainage. This is not simply an alkali problem but a determination of the nature and quality of the soil, so that a decision may be reached as to the practical farming value of the land if the area involved were reclaimed by drainage.

CHEMICAL INVESTIGATIONS IN POULTRY HUSBANDRY

Poultry husbandry as well as all other branches of animal husbandry has numerous problems, the solution of which lies in the application of the theories and principles of chemistry. For this reason and the increasing importance of the poultry industry the services of a chemist were placed at the disposal of the Poultry Division of the Central Farm and during the past year a beginning has been made on several lines of investigational work.

Incubation.—The losses suffered by the farmers and poultrymen of Canada due to poor results in incubation amount to millions of dollars annually. It is generally believed that the purity of the air and its moisture content in the incubator materially affect the vitality of the developing embryo. To determine conditions existing in the incubators used by the Poultry Division the air in all the machines was analysed. The air in a 10,500-egg Buckeye incubator, in use for the first time, was found to have a moisture content of 0.618 per cent and carbon dioxide content of 0.250 per cent at the top where the eggs were less than seven days old, while at the bottom or hottest part where the eggs were between 14 and 18 days in the incubator, the moisture

11 GEORGE V, A. 1921

content was 0.532 per cent and the carbon dioxide content was 0.227 per cent. A 350-egg Buckeye incubator and a 150-egg Cypher's incubator in use in the same cellar at the same time showed moisture contents of 0.896 and 0.910 per cent and carbon dioxide contents of 0.206 and 0.252 per cent.

To study this question in detail a special incubator designed to meet the needs of a strictly scientific investigation, i.e., control of the various factors, temperature, humidity, etc., was built. Preliminary tests seem to indicate that this machine will prove satisfactory. A detailed description and results obtained will be given when further work has been carried out.

Nutrition.—The study of the nutrition of poultry has not advanced to the same degree as for other classes of live stock, and coefficients of digestibility and the protein and caloric requirements per diem for poultry have only been determined in a few instances. As a first step in this study, a feeding experiment on chickens was carried out. Twelve pens of forty-two chickens each were fed for a five-week period and weekly gain in weight and the mortality noted. The basal ration consisted of finely cracked corn, wheat and oats and finely-ground bran, shorts and cornmeal. Pen No. 1 received the basal ration only, the rations in the other pens being supplemented by one or more feeds, e.g., greens, eggs, meat and milk. Pen No. 1, the poorest, lost 31 birds and the survivors made an average gain of only 1.67 ounces. Pen No. 9, fed meat, eggs and greens in addition to the basal ration, suffered the lowest mortality, 4 birds or 10 per cent, and gained 5.26 ounces per bird, while in Pen No. 11, which had a ration similar to No. 9 but had milk to drink, the mortality was 7 birds but the gain of 5.87 per cent was the highest pen average. The relative value of these four feeds can be well shown by a comparison of the results when they were fed singly in addition to the basal ration. Pens 2, 3, 4 and 5 received meat, eggs, milk and greens respectively and the mortalities were 26, 18, 28 and 24 while the average gain per bird was 3.32, 3.44, 2.79 and 2.81 ounces. These figures clearly demonstrate the value of eggs as one of the first ingredients of food for young chicks.

Proposed Work.—The work begun in 1919 will be carried forward during 1920. Nutritional investigation work on chicks will be developed and extended to older fowl. The study of "watery" eggs and new laid eggs with "heavy" yolks, which the trade classify as extras rather than specials, with a corresponding lower price, will be investigated and special attention paid to the keeping qualities of these eggs in storage.

SUGAR BEETS FOR FACTORY PURPOSES

Eighteen years ago this division began the systematic testing out of approved varieties of sugar beets as to quality and yield and this investigation continued from year to year is now carried on, as far as the growth of the beets is concerned, on sixteen of the Farms, Stations and Substations of the System. By this means data of a reliable character are being amassed as to the suitability of soil and seasonal conditions for the successful growth of this crop at a number of widely-distant points throughout the Dominion.

For a long number of years the seed sown in this investigation was specially imported from Messrs. Vilmorin, Andrieux et Cie, Paris, France, the varieties being those with a high reputation for both sugar and yield. For the past three years Canadian grown seed has been largely used in this experiment and it is gratifying to record that in every respect the results have been as satisfactory as those from the best imported seed.

SESSIONAL PAPER No. 16

With one exception, Wohanka, imported from Russia, the seed sown last season (1919) was all grown in Canada, that denoted "Chatham" and "Waterloo" being Ontario grown, that designated as "British Columbian" being from the province of that name. All the seed used was obtained through the courtesy of the Dominion Sugar Co., Wallaceburg, Ont.

The varietal averages, as obtained from the results of the analyses of the beets grown at the sixteen points in the Dominion, in respect to sugar content, are as follows:—

VARIETIES OF SUGAR BEETS, 1919.

Source of Seed	Sugar in juice (average)	Coefficient of Purity (average)
Chatham (Ont.).....	16.30	84.56
Wohanka (Russian)	17.17	85.49
Waterloo (Ont.)	17.34	80.92
British Columbia	17.71	85.89

These results are somewhat higher than those of 1918 and are to be regarded as indicating an exceedingly satisfactory root for sugar extraction. They furnish further proof that beets from home-grown seed may be fully equal in richness and purity to those from the best imported stock.

The detailed data in connection with this work are unfortunately too voluminous for this summarized report, but the following averages as obtained from the several averages will be of particular interest in showing at a glance the richness of the beets as grown at sixteen of the Farms and Stations of the System throughout the Dominion:—

AVERAGE PERCENTAGE OF SUGAR IN JUICE, 1919.

	Sugar in Juice Per cent
Charlottetown, P.E.I.	18.33
Kentville, N.S.	19.25
Nappan.	18.83
Fredericton, N.B.	20.94
Lennoxville, Que.	15.91
Cap Rouge, Que.	16.88
Ste. Anne de la Pocatière, Que.	18.89
Le Ferme, Que.	16.05
Ottawa, Ont.	17.79
Scott, Sask.	14.39
Indian Head, Sask.	15.68
Lethbridge, Alta (Irrig.)	14.31
Fort Vermilion, Alta.	17.35
Agassiz, B.C.	17.02
Sidney, B.C.	17.98
Invermere, B.C.	14.72

The analytical and "yield" data of this investigation for the past eighteen years are now being carefully studied in relation to seasonal conditions—temperature, precipitation, etc. It is expected that this inquiry will indicate and more or less closely delimit those areas or districts in which, in so far as natural conditions are concerned, sugar beets might be successfully grown for sugar production.

FIELD ROOTS.

The object of this investigation, now in its fifteenth year, is the determination by chemical analysis of the relative nutritive or feeding value of the several varieties of mangels, turnips and carrots grown for stock use. The roots examined were grown on the Central Farm, Ottawa, by the Division of Forage Plants, and the laboratory determinations were dry matter, sugar in juice and the weight of root.

11 GEORGE V, A. 1921

Mangels.—The series including eighty reputed varieties comprised eighty samples grown from seed obtained from 11 of the more important Canadian seed houses, and the varieties included all those types generally found upon the market.

It will only be possible in this report to present averages and the more important summaries.

MANGELS, 1919.		
	Dry Matter Per cent	Sugar in Juice Per cent
Maximum..	18.29	8.61
Minimum.	8.42	3.46
Average of 80 varieties	12.58	6.26
Average for 15 years.. . . .	11.13	5.76

The six varieties first in the series as to nutritive value, in the order of merit, are: Giant Yellow Oval, Mammoth Golden Giant, Giant Yellow Intermediate, Mammoth Long Red, Red Emperor and Gate Post. All these contained over 15 per cent of dry matter, with a sugar content ranging from 7.5 per cent to 8.5 per cent.

The following table epitomizes the more important data obtained in this investigation during the past 15 years:—

MANGELS—YIELD AND AVERAGE COMPOSITION, 1904-1919

Year	Number of varieties analysed	Average weight of One Root		Yield per acre		Dry Matter	Sugar
		lb.	oz.	tons	lb.	p.c.	p.c.
1904	10	2	11	30	1,277	11.60	6.62
1905	17	3	9	39	369	10.04	4.67
1906	16	2	7	31	159	11.63	5.93
1907	10	2	11	27	680	12.64	7.46
1908	12	2	2	23	690	11.87	5.33
1909	14	3	5	28	920	11.21	6.21
1910	8	5	10	56	57	10.04	4.46
1912	23	2	9	29	61	9.51	6.43
1913	13	2	14			10.51	5.63
1914	24	2	1	23	50	12.79	7.75
1915	36	3	9	36	1,157	9.25	4.27
1916	26	2	0	17	428	8.86	2.66
1917	31	1	15			12.64	6.72
1918	13	2	4			11.78	6.13
1919	80		14.37			12.58	6.26
Average for 15 years		2	11			11.13	5.76

Influence of Heredity in Mangels.—There are several distinct and well-recognized types of mangels and the evidence of this investigation, now in its twentieth year, clearly shows that well defined varieties possess and transmit, in a marked degree, characters as to quality or composition. In illustration of this fact the results of our analysis of the “Gate Post” and “Giant Yellow Globe,” two very widely-grown varieties and representative of two distinct types, may be presented. In the following table the epitomized results of this investigation are given and it will be observed that throughout the whole period, without a single exception, the Gate Post has proved the superior variety.

SESSIONAL PAPER No. 16

DRY MATTER AND SUGAR IN GATE POST AND GIANT YELLOW GLOBE MANGELS

Season of Growth	Gate Post				Giant Yellow Globe			
	Average weight of one root		Dry Matter	Sugar in Juice	Average weight of one root		Dry Matter	Sugar in Juice
	lbs.	oz.	p.c.	p.c.	lb.	oz.	p.c.	p.c.
1900.....			11.14	6.15			8.19	2.64
1901.....	2	9	9.41	4.15	3	3	9.10	4.08
1902.....	3	2	13.90	9.39	3	9	10.24	5.24
1903.....	3	3	12.93	7.38	3	13	10.89	6.17
1904.....	2	14	12.64	7.62	2	13	9.24	5.26
1905.....	2	13	12.07	6.83	3	12	8.64	3.55
1906.....	2	2	12.90	6.59	1	8	12.73	6.45
1907.....	3	10	12.53	7.25	2	7	10.78	6.34
1908.....	1	11	12.02	4.94	2	4	10.66	4.47
1909.....	3	14	11.82	6.64	3	7	10.95	5.82
1910.....	6	8	9.59	4.26	6	13	7.80	2.74
1911.....	2	11	10.04	3.86	3	1	6.66	1.85
1912.....	3	5	8.98	5.05	3	2	7.87	4.75
1913.....	3	5	10.98	6.27	2	15	8.90	5.18
1914.....	2	11	14.40	8.00	2	1	11.16	6.32
1915.....	2	15	11.41	4.15	2	12	8.21	3.31
1916.....	1	10	9.79	4.07	1	9	8.68	3.17
1917.....	1	13	14.24	7.41	2	0	11.39	5.89
1918.....	2	8	12.87	7.22	2	44	9.73	2.84
1919.....		11	15.5	9.4		14	10.68	5.50
Average for 20 years.....	2	3	11.95	6.33	2	13	9.62	4.57

It is well known that the composition of mangels, in common with that of farm roots generally and sugar beets, is influenced by seasonal conditions, but the fact that the two varieties analysed in this series have been grown side by side under practically identical conditions of climate and soil gives to the above results a special significance. They furnish satisfactory proof that distinct varieties possess in a marked degree qualities due to heredity and capable of transmission.

Turnips.—Ninety-five samples of turnips were analysed, the series containing ninety-five reputed varieties obtained from nine Canadian seed houses. The varieties include both swedes and fall turnips.

The following table presents the averages for the past fourteen years:—

TURNIPS, YIELD AND AVERAGE COMPOSITION, 1905-1919.

Year	Number of Varieties Analysed	Average weight of One root		Yield per acre		Dry Matter	Sugar
		lb.	oz.	tons	lbs.	p.c.	p.c.
1905.....	20	2	13	30	1,060	10.09	1.10
1906.....	20	1	10	15	1,890	12.18	1.78
1907.....	14	3	5	33	142	10.14	1.11
1908.....	13	3	12	27	1,033	9.87	1.52
1909.....	13	2	10	29	542	11.30	1.43
1910.....	10	3	11	31	565	10.87	1.07
1912.....	19	3	12	33	155	8.65	1.10
1913.....	19	2	14	24	1,271	9.58	1.54
1914.....	30	2	0	22	130	9.68	0.76
1915.....	33	2	11	19	1,522	9.60	1.29
1916.....	33	1	13	16	681	10.67	0.92
1917.....	58	1	13			11.04	1.41
1918.....	16	1	3	10	869	11.18	1.06
1919.....	95		13.3			12.10	1.11
Average for 14 years.....		2	11			10.49	1.22

11 GEORGE V, A. 1921

Lack of space forbids the inclusion of the detailed data of this work but two important conclusions therefrom may be stated as follows: (1) that turnips as a class contain somewhat less dry matter and considerably less sugar than mangels and (2) that the swede is decidedly richer both in dry matter and sugar than the fall turnips.

Carrots.—This series consisted of thirty-six samples, comprising thirty-six reputed varieties, obtained from nine Canadian seed houses.

CARROTS. YIELD AND AVERAGE COMPOSITION, 1905-1919

Year	Number of varieties Analysed	Average weight of one root		Yield per acre		Dry Matter	Sugar
		lb.	oz.	tons	lbs.	p.c.	p.c.
1905.	11	1	3	25	1,510	10.25	2.52
1906	10	1	2	19	1,605	10.59	3.36
1907	6	1	1	24	1,517	10.30	3.02
1908	6	1	3	22	133	10.89	3.34
1909	6	1		17	1,680	10.40	2.30
1910	5	1	9	13	1,640	10.17	3.23
1912	6	1	1	18	545	10.50	2.54
1913.....	6		8	24	1,100	9.11	2.11
1914	8		10	21	1,359	11.42	2.62
1915	10		6	16	1,500	10.08	1.86
1916	10		7	11	1,140	11.40	2.87
1917	13		10			12.69	2.92
1918.	3		6	31	266	12.13	5.30
1919.	36		7.2			12.04	2.79
Average for 14 years.			14			10.85	2.91

In nutritive value, as measured by dry matter and sugar, carrots as a class are superior to turnips; varietal differences, as in the case of mangels and of turnips, were quite marked, indicating the value of this work which permits the classification of the roots according to their nutritive value.

Speaking generally the season of 1919 was conducive to the development of a high quality of roots, which in both dry matter and sugar were above the average.

The summarized data of this investigation are presented in the following table:—

AVERAGE COMPOSITION OF MANGELS, TURNIPS AND CARROTS

Class of Roots	Average for period of	Dry Matter	Sugar
		p.c.	p.c.
Mangels	15 years.....	11.13	5.76
Turnips..	14 years	10.49	1.22
Carrots ...	14 years.....	10.85	2.91

THE FERTILIZING VALUE OF RAIN AND SNOW

This investigation, begun in 1907, has had for its chief object the determination of the amount of available nitrogen furnished per acre per annum by the rain and snow, the collections and analyses being made at the Central Farm, Ottawa. Every fall of rain and snow throughout the year is measured and separately analysed. The latter point is an important one as the analysis of monthly composites, preserved by an anti-septic was found unreliable at the outset of the work.

SESSIONAL PAPER No. 16

The determinations in the laboratory are free ammonia, albuminoid ammonia and nitrogen in nitrates and nitrites, these three forms constituting the nitrogenous compounds in the precipitation capable of furnishing food for crops.

During the year ending February 29th, 1920, 79 samples of rain and 24 of snow were analysed.

The total precipitation of the year, March 1, 1919 to February 29, 1920, was 33.23 inches, consisting of 23.39 inches of rain and 98.5 of snow—10 inches of snow being considered as the equivalent of 1 inch of rain. The total nitrogen furnished by this precipitation amounted to 7.117 pounds per acre.

Many features of scientific interest have been brought out by this investigation, but it must suffice for this summarized report to insert here merely the important data from the agricultural point of view. These are presented in the following tabular form, together with similar data for comparison for the preceding two years and the average for the first decade of the investigation.

PRECIPITATION AND AMOUNTS OF NITROGEN FURNISHED BY RAIN AND SNOW

	Total precipita- tion in inches	Nitrogen		
		By rain lbs. per acre	By snow lbs. per acre	Total lbs. per acre
Year ending February 28th, 1918	32.86	4.719	1.540	6.259
Year ending February 28th, 1919.....	35.59	4.929	0.916	5.845
Year ending February 29th, 1920.....	33.23	5.909	1.208	7.117
Average for 10 years ending February 28th, 1917.	33.17	5.482	1.101	6.583

While the total precipitation for the year closely approximates the normal—the average for the past 29 years being 33.68 inches—the amount of nitrogen furnished thereby is somewhat greater than the average obtained from the first ten years' work.

This investigation has shown that the precipitation in the neighbourhood of Ottawa furnishes approximately 6.5 pounds of nitrogen per acre usable as crop food, of which about 85 per cent, or roughly 5.5 pounds, is contributed by the rain. At a conservative estimate we may place the value of this plant food supplied per acre by the rain and snow at \$1.75.

THE COMPOSITION OF WHEAT AS INFLUENCED BY SEASONAL CONDITIONS

This study, begun in 1908, has shown that climatic or seasonal conditions not only affect the yield but may profoundly modify the protein content of the grain. The plan of the investigation is simply to sow wheat from the same stock on the Farms and Stations of the Experimental Farm system, making careful weekly observations of the crop, weather, etc., throughout the season of growth. A sample of the harvested wheat from each of the plots is forwarded to the laboratories at Ottawa and analysed.

In this work, the Division is fortunate in having enlisted the co-operation of the Meteorological Service, which has undertaken the plotting, tabulation and correlation of the statistics and data.

Press of urgent work during the period of the war has made it necessary to defer the analysis of the wheat samples since 1916. These are now in course of analysis and as soon as completed the results will be correlated with the weather statistics. By this means the growth, yield and composition of grain may be studied as affected by environment.

The earlier results of this investigation indicated that the conditions conducive to a hard berry with a high gluten content, characteristic of wheat of high quality, are a moderately dry soil and fairly high temperatures during that period in which the kernel is filling out and maturing.

11 GEORGE V, A. 1921

FEEDING STUFFS

As a result of war conditions not only has the price of all feeding stuffs greatly advanced but a large number of exceedingly poor feeds have been put on the market. This inferiority of quality or adulteration has been chiefly, but not entirely, found in chop feeds and feeds of an allied nature sold under proprietary names, and is due to the presence of mill waste and sweepings, oat hulls and weed seeds, many of which render the feed unpalatable and in cases dangerous to stock.

To ascertain the extent to which such inferior and dangerous feeds were on the market a special collection, comprising about 400 samples, was made throughout the Dominion. These have been submitted to chemical analysis as to nutritive value and, through the co-operation of the Seed Branch, to microscopical examination for the detection of noxious weed seeds and other foreign matter. This work is now completed and is being classified and tabulated for publication in bulletin form.

The widespread dissatisfaction that was felt with regard to the purity and quality of many feeds on the market has naturally led to numerous inquiries respecting feeding stuffs of all kinds, from farmers in various parts of the Dominion and more particularly from Ontario, Quebec and the Maritime provinces. In not a few instances claims have been made that the feed or feeds in question have been found unpalatable to stock or entirely refused even when diluted with other feeds of first-class quality. Other farmers have reported that certain feeds have proved of little nutritive value, the animals fed thereon showing marked lack of thrift; and again we have had cases presented to us of alleged fatal results from their use.

In the course of this work a considerable number of samples were sent in for examination. These included bran, shorts, middlings, feed flour, oat by-products, barley by-products, chop and mixed feeds of various kinds, gluten feed and corn by-products, special poultry feeds, oil cake meal, cotton seed meal and ground screenings.

Among the miscellaneous feeds analysed may be mentioned fish meal, beef meal, tankage, dried brewers grains, dried potato pulp, evaporated skim milk, dried carrots, sunflower seed, locust bean, cana-mola, refuse from the manufacture of ice cream cones.

Since it is impossible in this summary to discuss these feeds in detail it must suffice to indicate our findings in general terms.

It must first be stated that the results have indicated that the larger number of staple feeds, bran, shorts, middlings, feed flours, oil cake meal, etc., while naturally varying somewhat in composition according to the process of milling or manufacture, are practically free from sweepings, mill refuse, weed seeds or other foreign matter. A few of the samples of bran and shorts examined were of inferior quality, showing an objectionable admixture of sweepings and weed seeds, but such cases were exceptional. If the material is finely ground the detection of adulterants by mere inspection is frequently impossible, though, by tasting, the presence of certain of the unpalatable and noxious weed seeds may be detected. In such cases, however, a microscopical examination is necessary as supplemental to the chemical analysis. In this connection and by way of illustrating the value of microscopical work it may be stated that several cases of adulteration with cocoa shells in oil cake meal and pea hulls in chop feeds were detected.

Adulteration is most frequently found in the chops and mixed feeds, a number of which are put on the market under brand names. These need careful scrutiny, chemical and microscopical. Certain of them are unduly loaded with ground oat hulls—a fibrous and worthless product from the standpoint of nutritive value—while others have been found to contain large admixtures of objectionable weed seeds. This latter form of adulteration may not lower the percentages of the more valuable nutrients in the feed, indeed many weed seeds possess a higher protein and fat content

SESSIONAL PAPER No. 16

than the feed which they serve to adulterate. Their presence however is to be deprecated on the ground of making the feed unpalatable, less digestible and possibly directly poisonous.

Analysis has been made of a number of forages, among which the following list of silages stands out as notable: sunflower; Japanese millet; sweet clover; oat, pea and vetch; pea and corn; pea and corn refuse from cannery.

FLOUR

Shortly after the outbreak of the European war the Division was entrusted with the official examination of all flour purchased in Canada by the British War Office. This control work has been carried on continuously to date. The purchasing for military and civilian use overseas was taken over in 1917 by the Wheat Export Company, the Official Canadian Agents of the Allied Governments and more recently by the Canadian Wheat Board. During the year 3,916 samples of flour have been examined and reported on as to moisture content.

This control work has not only effected a very large pecuniary saving to the Empire and the Allies but has served to ensure, by keeping down the moisture content, the flour from spoiling during ocean transportation and storage. It has also undoubtedly been of value in maintaining and enhancing the reputation enjoyed overseas by Canadian flour for quality and strength.

PACKING HOUSE AND CANNERY PRODUCTS

An important phase of the laboratory work is the chemical control of the products of establishments—packing houses, canneries, etc.,—under the provisions of the Meat and Canned Foods and Oleomargarine Acts. This work which is necessarily of a very varied character is undertaken for the Meat and Canned Foods Division, Health of Animals Branch, Department of Agriculture and the results reported to the Veterinary Director General.

During the year 1919-1920 a total of 1,809 samples were submitted to chemical or microscopical examination. These are classified in the following table:—

Lards, tallows, oils, oleomargarines and butter..	335
Preserved meats, sausages, mince meats, etc..	81
Pickling solutions..	72
Spices and condiments..	101
Evaporated apples, waste, etc..	648
Preservatives..	36
Miscellaneous, including condensed milks..	536
	<hr/> 1,809 <hr/>

A considerable amount of investigatory work has been done in connection with the examination of these samples, but it is impossible in this summary to enter into details. It must suffice to say that important results have been obtained in several lines and that this whole work of control has been carried out in as practical and thorough a manner as possible.

WATERS FROM FARM HOMESTEADS

The total number of waters from farm homesteads analysed during the year was 103. Of these 23 per cent were found to be pure and wholesome, 13 per cent suspicious and probably dangerous, 28 per cent seriously polluted, and 36 per cent too saline to be potable. Quite a number of samples received were too small for the purpose of a satisfactory analysis, and in this connection we would point out to those desirous of an analysis that they should first apply to the Division for an application form giving directions as to collection and shipment of the sample. No fee is charged for the analysis but the express charges must be prepaid.

11 GEORGE V, A. 1921

An ample supply of pure water is one of the most valuable assets that a farm can possess and no reasonable expense should be spared to procure it. Pure water is one of the most potent factors which make for the good health of the farmer and his family, the thrift of his live stock and the quality and wholesomeness of his dairy products.

The cause of contamination in the larger number of instances is the access to the well of drainage of an excretal character, from stable, barnyard, privy, etc. Our records show that the polluted wells for the most part are shallow, merely collectors of seepage water from the surrounding soil, and located, for the sake of convenience, near the farm buildings in the barnyard, making contamination practically inevitable. It should be remembered that impure water of the character indicated is always a menace to health.

DIVISION OF BOTANY

REPORT OF THE ACTING DOMINION BOTANIST.

E. S. ARCHIBALD, B.A., B.S.A.

AMENDMENTS TO THE DESTRUCTIVE INSECT AND PEST ACT

By Order in Council passed April 4, subsection *f* of section 7 of the Destructive Insect and Pest Act relative to admitting currant and gooseberry plants from the state of New York into the province of Ontario, was amended, providing for the admission of said vegetation into the province of Ontario from the state of New York.

Section 12 of the same Act was amended April 4, prohibiting shipments of five-leaved pines, currant and gooseberry plants into Alberta and British Columbia from any other province of the Dominion.

By Order in Council passed on April 19, subsection *g* is added to section 7 of said Act, prohibiting the importation into Canada of certain species, hybrids and varieties of *Berberis* and *Odostemon* (Mahonia).

Section 12 of the same Act was amended April 19, prohibiting shipment of certain species, hybrids and varieties of *Berberis* and *Odostemon* (Mahonia) specified under subsection "*g*", section 7, into Manitoba, Saskatchewan and Alberta from any other province of the Dominion.

WHITE PINE BLISTER RUST

Scouting.—Surveys were conducted to learn the distribution of the blister rust fungus in northern Ontario. The rust fungus was found on the following number of properties: three out of forty-one in Simcoe county; three out of eleven in Muskoka district; not one out of twenty-one in Haliburton county; three out of thirty-two in Hastings county; twenty-five out of ninety-two in Renfrew county; not one out of seventeen in Temiskaming and Kenora districts. The scouting that was done in northwestern Ontario was not extensive enough to be conclusive that the fungus does not exist there.

Control Areas.—The establishment of four control areas begun in 1918 was completed in 1919 and a fifth area was laid out. The control areas are located as follows: Lincoln county, Ontario; Bowmanville, Ont.; Carillon, P.Q.; Berthierville, P.Q., and Lachute, P.Q. The object of the control areas is to determine the efficiency of removing all currants and gooseberries within the area, as well as those within five hundred yards of the control areas. Results will not be obtainable for a period of years.

SESSIONAL PAPER No. 16

The surveys of thirty-five pine woodland areas in the Niagara peninsula, around Oakville and in Simcoe county, conducted in 1918 and checked in 1919 have shown that:—

(a) While an average of about two per cent of the trees examined are infected, in a few cases as high as twenty to thirty per cent are infected.

(b) No increase in the number of diseased trees was found in 1919 over the number found in 1918.

POTATO INSPECTION SERVICE

The inspection service has been conducted from the central laboratories instead of from Charlottetown laboratory. This was found to be necessary in order to give the work the closest supervision possible.

The work is being continued along systematic lines with certain modifications aiming at an improvement of the service. The main difficulty arises from the use of temporary men, who lack experience, but every precaution is being taken to prevent the consequences arising from errors on their part. The work this season included the province of Alberta where much interest is being shown.

FIELD LABORATORIES

ST. CATHARINES, ONT.

The investigational work at the Laboratory of Plant Pathology at St. Catharines, Ont., the past year was interfered with by the fact that the officer in charge, Mr. W. A. McCubbin, resigned on June 1, and his successor, Dr. W. H. Rankin, formerly of the Plant Pathological Staff, Cornell University, was not appointed until October.

Brown Rot of Stone Fruits.—In continuation of certain surveys conducted in 1918 to determine the prevalence and importance of brown rot of stone fruits, similar surveys were conducted in 1919. These surveys included an apothecial survey, a blossom injury survey, and tabulations of the amount of loss on the trees, in the market and in cold storage. The most important points learned from these surveys are as follows. In peach orchards, not plowed, there were found an average of 5.44 apothecial clusters under each tree, while in orchards, spring plowed, an average of 1.44 clusters, and in orchards, fall plowed, an average of 1.93 clusters under each tree. In the case of plum orchards the difference was not so large. In orchards, not plowed, there were an average of 3.64 clusters under each tree, in orchards, spring plowed, 2.15 clusters, and in orchards, fall plowed, 1.22 clusters under each tree. The amount of blossom injury was found to range from 4 to 73 per cent for peaches, from 0.4 to 95 per cent for cherries, and from 0.0 to 94 per cent for plums. In seventy-five out of one hundred and twenty-two peach orchards examined, the blossoms injured by brown rot ranged from 10 to 30 per cent; in fifty-eight of eighty cherry orchards it ranged from 1 to 50 per cent, and in sixty-nine of the eighty-six plum orchards from 1 to 20 per cent. The amount of injury occasioned by brown rot at the time of maturity of the fruit was determined in forty-six orchards in the Niagara Peninsula to vary from 1.2 to 9.5 per cent.

Peach Canker Eradication by Surgery.—The experimental work on the eradication by surgery of the peach canker in a commercial orchard was continued in 1919. Results are to be tabulated after another season's work.

Raspberry Leaf Curl or Yellows.—An attempt was made to determine in two commercial plantations if the removal of the affected bushes was sufficient to check the spread of yellows or leaf curl. The results this season seem to indicate that it does not prevent the spread of this trouble, but no definite statement can be made until the work has been continued for a longer period.

11 GEORGE V, A. 1921

New Projects Started.—The reorganization of the laboratory and field work under the new officer in charge was completed during the winter. Additional floor space is now available for the proper arrangement of the new laboratory equipment. The laboratory is now well equipped to carry out its functions in this district except that land and greenhouse facilities are not yet provided for. It is to be hoped that these necessary adjuncts to the laboratory will soon be forthcoming.

1. Leaf curl of raspberry. Investigations to determine the connection between true leaf-curl and the composite disease known as yellows. An effort is to be made to determine the specific cause of leaf curl and the manner of its transmission.

2. Canker of peach. Investigations to determine the cause or causes of peach canker and the relation between environmental and biotic conditions which determine its variations in prevalence and destructiveness.

3. Tests of spray mixtures and dusts on plums and cherries. A comparison of four liquid and dust schedules for the control of insects and diseases. This project is to be carried on in co-operation with the Entomological Branch.

4. Comparative tests of the more practical spraying and dusting schedules for apples on a commercial scale. This project is to be carried on in co-operation with the Entomological Branch and the Fruit Branch of the Ontario Department of Agriculture.

5. Comparative records on the results obtained in practice by growers in controlling fruit diseases with the object of determining the best control practices now in use.

6. Plant Disease. Survey. A determination of the losses due to the commoner diseases of cultivated plants in Southern Ontario, as a part of the general survey now being organized to include the entire Dominion.

7. A determination of the fundamental reactions of plants during infection and the development of diseases which it is hoped may aid in determining means for controlling the factor of susceptibility.

Several requests during the winter were acceded to for assistance on the programmes of institutes and agricultural organizations.

CHARLOTTETOWN, P.E.I.

The officer in charge, Mr. P. A. Murphy, left the Department to assume more remunerative work with the Department of Technical Instruction in Ireland.

Experiments and Laboratory Investigation on Potato Diseases.—The principal diseases dealt with were, early and late blight, leaf roll, mosaic, curly dwarf and similar diseases, wilt and powdery scab.

The results of previous years' work on late blight were amply verified by those obtained in the season just past. The year was a particularly favourable one for the spread of this disease and it was found that five sprays were necessary to control it instead of four, as formerly recommended. Experiments were continued on a larger scale than before to determine the way in which the disease spreads, special attention being taken of the relation of air and soil temperatures.

Experiments on the investigation of leaf roll and mosaic were continued which proved conclusively that both these diseases infect neighbouring healthy plants. Up to the present no casual organism has been found; insects which attack the vines are believed to be responsible, in part at least, for the spread of mosaic in the field, the same may also apply to leaf roll through the agency of soil insects. In the series of experiments carried out in collaboration with the Superintendents, at Charlottetown, Kentville, Nappan, Fredericton, Lennoxville, Ottawa, Brandon, Indian Head, and on a private farm at Fort William, Ont., it was found that climatic conditions have considerable influence in determining the amount of disease present. It was shown that diseased seed originally grown at Charlottetown developed little or no symptoms

SESSIONAL PAPER No. 16

of mosaic when planted at Brandon and Indian Head, but when the same seed was again returned to Charlottetown the disease proved to be as virulent as before.

Work was started to determine whether diseases of the curly dwarf type, which have been named temporarily "Crinkle and Leaf Drop," are communicable to healthy plants of the same variety in adjacent rows.

The investigations of wilt and powdery scab were continued as in previous years. Very little powdery scab was found in any of the plots, the corrosive sublimate treatment 1-2000 for three hours together with formalin 1-300 for three hours being the most effective.

Spraying Demonstrations.—Potato-spraying demonstrations were conducted on twenty farms in Prince Edward Island with a horse-power machine with excellent results, the farmers in every case being thoroughly satisfied and firmly convinced that spraying pays. Their remarks may be summed up in a few words: "Thorough spraying is the only means of growing a sound crop of potatoes." The amount of rot which developed in unsprayed portions of these fields ranged from 0.0 per cent in the resistant varieties up to 85 per cent in the susceptible varieties, while the sprayed plots resulted in an increased yield in every case, as well as a sound crop.

As a result of this work several machines are being purchased for next season's work, not only in the districts where the demonstrations were carried out, but also in others. Spraying is becoming more general every year.

FREDERICTON, N.B.

The investigational work conducted during the year 1919-20 consisted of a continuation of experiments previously started with a few additions, including field and cellar inspection of potatoes, potato spraying and dusting, leaf roll and mosaic diseases of potatoes, anthracnose of beans, bean mosaic, sclerotinia rot of beans, glume spot of wheat, turnip steckling rots, club-root of crucifers, and observations on other diseases occurring during the growing season.

Potato Spraying.—In conjunction with other pathologists a potato-spraying experiment consisting of thirty plots was conducted to determine the proper time for spraying, and the number of applications required to give the best returns. The period of commencement, the period between applications and the number of applications varied with each plot.

The largest returns and the least rot were obtained with five or more applications commencing when the plants were about eight inches high and continued at intervals of ten days. The increased yield from five or more sprays varied from 100 to 108 bushels per acre with from 25 to 28 bushels less rot per acre.

Bean Anthracnose.—This disease was not so severe this season as during the summer of 1918 and the results were consequently not so evident, but confirm in a large measure the results obtained last year. The work consisted of experiments on,—

- (1) Seed selection.
- (2) Seed treatment.
- (3) Spraying.
- (4) Resistant varieties.
- (5) Seed from different sources.

Seed Selection and Seed Treatment.—While not serving as complete control measures, seed selection and seed treatment confirm the results of last year in that selected and treated seeds develop less disease than unselected or untreated seed. Moreover, the disease did not become pronounced until later in the season.

11 GEORGE V. A. 1921

Spraying proved of considerable value but not a control measure. Serious injury to the foliage was produced by the first and second sprays; the injury caused probably equalled the beneficial effects produced by the spray. The spraying in some tests had to be discontinued on account of the injury.

Resistance of Different Varieties.—No varieties have been found immune and, in fact, the Well's Red Kidney Wax, which was practically free last year (one or two pods slightly spotted) developed considerable disease this year; some pods were badly injured.

Bean Mosaic.—The experiments on bean mosaic consisted of tests to determine:—

- (1) Its presence or absence in commercial beans offered for seed purposes.
- (2) To what extent the disease is hereditary.
- (3) Its nature and methods of spreading.

These studies show that commercial stock may contain considerable quantities of mosaic infected seed, some lots developing as high as 23 per cent diseased plants before the disease commenced to spread in the field.

Heredity.—Seed obtained from diseased plants in Ontario (grown during 1918) when planted reproduced diseased plants to the extent of 43 per cent on first count; many diseased plants developing later. It was impossible to determine whether these later developments were from diseased seed or the result of infection from neighbouring plants in the field. Not all seed from diseased plants produced diseased progeny. The results obtained, however, undoubtedly proved that the disease is hereditary since seed grown in New Brunswick, and known to have been free from the disease the previous year, did not develop mosaic, except a few individual plants in rows adjacent to a diseased row and which developed late in the season. Two lots of seed, supposedly from healthy plants collected in Ontario were tested; one from Vineland proving to be free from the disease, while the one collected at Dutton from a diseased field showed a high percentage of infected plants.

Transmissibility.—The disease was transmitted from diseased to healthy plants by means of hypodermic injections with extracts from diseased leaves, and by pressing leaves of healthy plants between the fingers moistened with the extract from infected leaves, as high as 100 per cent infection being obtained by both methods.

GRAIN RESEARCH IN WESTERN CANADA

Work was carried on during the season of 1919 with headquarters at the University of Saskatchewan, Saskatoon, and field stations at Brandon and Indian Head.

Field and Laboratory experiments were undertaken to determine the life-history and method of control of the smut of western rye grass, which is more or less prevalent all over Western Canada. The experiments were successful and showed that this smut belongs to the seedling infection group and may readily be controlled by seed treatment, with a solution of formaldehyde as in the case of oat smut.

Experiments were also carried on to determine the injury to grains caused by treating with solutions of formaldehyde of various strengths. The seed was tested for germination at the Seed Branch Laboratory at Calgary. The results showed that practically no injury resulted from treatment with the solutions of formaldehyde commonly used. They, however, indicated that spraying with a strong solution of formaldehyde may seriously injure germination in wheat, especially if an excess of the solution is used. By field experiment at Indian Head, this dry method, as it is sometimes called, gave good control of oat smut and no evident injury to the seed.

There was a severe outbreak of stem rust in southern Manitoba and in parts of Saskatchewan, and great loss, especially of the later sown grain. Leaf rust of wheat has also been severe in some districts in Manitoba, but did little damage in comparison with the stem rust. Alberta was practically free from rust, until the grain was generally harvested.

SESSIONAL PAPER No. 16

Careful attention was given to the study of the overwintering and origin of spring infection of the stem rust, but without much result. It was found, however, that the summer spores of this rust may survive the winter on grasses, and it is possible that spring infection may arise from these spores. There was, however, no direct evidence that this is the case.

To gain information as to the best time of cutting rusted grain, experiments were carried on at Indian Head and an opportunity was given to study similar experiments carried on at the Manitoba Agricultural College by the Field Husbandry Department. Both of these experiments indicated that a greater yield was obtained by leaving the grain to mature than cutting earlier.

Some time was spent in a barberry survey in Manitoba, and a number of barberries were located. It is expected that all these will be eradicated before the season for infection.

The stripe disease and related diseases due to species of *Helminthosporium* were locally severe in barley. There was also considerable wheat attacked by *Helminthosporium*. The scab of wheat caused by *Fusarium culmorum* was quite prevalent in the districts in Manitoba where there was a considerable rainfall, but not much was noticed in Saskatchewan.

Some investigational work on the stem and leaf rusts of wheat was undertaken in the greenhouse at Saskatoon but sufficient space was not available for extensive work till late in the season. This phase of the work will receive more attention in the future.

GENERAL ECONOMIC BOTANY

During the year a large number of requests of the usual kind, namely, information on the best methods of controlling certain weeds, poisoning of domestic animals by various plants, medicinal uses of plants, culture of wild rice, etc., were received. Miscellaneous enquiries covering a wide range of subjects were received dealing with such questions as the cultivation of aromatic plants, insect flowers, utilization of juniper berries, sumac, peanuts, guayule rubber, the treatment of hawthorn seeds with sulphuric acid to facilitate germination, etc.

The number of weeds and wild plants sent in for naming and report on their properties was smaller than usual, amounting to 631 specimens.

In connection with the Herbarium a specimen case containing 100 species of seeds of weeds and other plants in bottles was received through the kindness of the Seed Commissioner. Four dried specimens of plants were received from Mr. W. B. Anderson, of British Columbia, and a white-fruited specimen of Juneberry, sent in from Rigaud, Quebec, was added to the Herbarium.

Information having been received from the Board of Public Works that certain harbours on the Atlantic coast were being blocked up by drifting sand, and a suggestion having been made that some person should visit these localities, Miss F. Fyles paid a visit to New Brunswick and Nova Scotia and made a study of the present condition of the sand-dunes and collected samples of the different kinds of vegetation growing thereon.

Copies of the Annual Exchange List of Seeds were sent out to various botanical gardens in British Columbia, United States, New South Wales, Japan, Italy, Switzerland, France, Holland, Ireland, Scotland, Denmark, and Sweden.

During the year 526 packets of seeds and 29 rooted plants were sent out and 573 packets of seeds were received from foreign botanical gardens.

Considerable additions were made to the collection of living plants in the Arboretum.

A sample of broom corn obtained from St. Eustache, Que., which appeared to be suited to the climate of Canada, was sown and proved to have a "brush" of a fair length. A considerable number of well-ripened seeds were obtained from it for further experiment.

11 GEORGE V, A. 1921

Press articles on Plants used for Tanning, Sunflowers, the Castor Oil Plant, the Cultivation of Mustard, and Broom Corn, were prepared and a bulletin on "Wild Rice," by Miss F. Fyles, was handed in for publication.

Some further progress was made during the year in the preparation of a Catalogue of the Native Plants of Canada.

THE CEREAL DIVISION

REPORT OF THE DOMINION CEREALIST, CHAS. F. SAUNDERS, B.A., Ph.D.

THE SEASON

The season of 1919 was, on the whole, unfavourable to cereals. In some parts of Eastern Canada good crops were produced, but, in other sections, as at Ottawa, the drought and extreme heat of June and early July very materially reduced the yield. However, the quality of the wheat was good, and that of the oats and barley was fair, though the grain was not so plump perhaps as usual. In some parts of Manitoba and over large areas in Saskatchewan and Alberta, unusual drought prevailed, amounting, in some cases, to a total destruction of the crop. In addition to the drought, there were high winds in some sections which, at times, produced disastrous consequences. Owing to these adverse conditions no crop was produced on the Experimental Station at Rosthern, or on the non-irrigated area on the Experimental Station at Lethbridge. The other Farms and Stations in these three provinces succeeded however, in obtaining results worthy of record, showing that even under conditions of unusual drought, good paying crops can sometimes be reaped.

Many sections of British Columbia also suffered from the remarkably dry weather, and though cereals are not an important crop in that province there was a considerable loss from the reduced yields.

At Ottawa, the first grain was sown in the fields on April 30, though seeding did not become general until several days later. Harvesting began on July 18, which was exceptionally early; and the first threshing was done on July 31.

TESTS OF VARIETIES

Almost every season reveals some possible improvement in the method of carrying on the plot tests of varieties. The system is therefore being gradually modified from year to year as experience accumulates. In spite, however, of the greatest care, it is not practicable, in very unfavourable seasons, to secure results of much value. Fortunately, at Ottawa, the weather is less liable to extreme fluctuations than at some other places and it is therefore possible, here, to obtain fairly good results every year from plot tests. During the past season, there were grown at Ottawa 570 very small plots of new varieties of wheat, oats, barley, peas and flax, and 596 regular test plots of cereals, etc. In addition to these, there were 36 plots of barley sown for hay purposes and 79 large strips of cereals for propagation. The total number of plots and strips at Ottawa was 1,281, representing about 1,100 varieties. Nearly all of these are new cross-bred sorts produced by the Dominion Cerealists.

MARQUIS WHEAT

It is a pleasure to be able to record still further triumphs for Marquis wheat. While during the last few years, some new varieties have been pushed into promi-

SESSIONAL PAPER No. 16

ence as rivals of Marquis, that variety again won the highest award in an international competition, last autumn, when Mr. J. S. Fields, of Regina secured the world's prize and sweepstakes for the best spring wheat at the International Soil Products Exposition, Kansas City, Missouri. The season in Saskatchewan was not very favourable, owing to dry weather and the prevalence of rust, but Marquis wheat did very well considering the adverse circumstances, and showed itself decidedly more resistant to rust than the variety Red Bobs with which it has sometimes of late come into competition.

HULLESS OATS

The new variety of hulless oats recently introduced by the Dominion Cerealists, under the name of Liberty, Ottawa 480, gave an excellent account of itself last season in almost every locality where conditions were at all favourable. Fortunately, it appears that this oat is likely to do best in those somewhat northern sections of Alberta where the raising of hogs and other live stock must always occupy a large and permanent place in agriculture. As the hulless oat makes excellent feed for almost all classes of animals, and particularly for young pigs, it is very gratifying to note its special adaptability to the region in question. Last autumn, when the annual distribution of free samples of seed grain began, there was very little demand for the Liberty oat, as many of the farmers had not heard of it up to that time. However, an announcement in the newspapers and agricultural journals soon brought too great a number of applications and we were unfortunately obliged to refuse very many of them. Arrangements have been made, however, for the growing of a much larger acreage during the coming season, and it is hoped that the supply of seed will be fairly adequate next winter, at least so far as the free distribution is concerned. Of course, in the case of any new variety of striking merits, it is impossible entirely to satisfy the demand for seed during the first few years.

RUBY WHEAT

The new extra-early ripening wheat called Ruby, Ottawa 623, which was introduced recently by the Dominion Cerealists, has done exceptionally well on some of the farms in rather northern latitudes in the central provinces. There is no doubt that this variety fills a real want in districts for which Marquis has proved a little too late in ripening and where the greatest possible earliness, such as is found in Prelude wheat, is not essential.

OTHER NEW VARIETIES

Three other new varieties which are attracting attention may also be mentioned. A new fibre flax under the name "Longstem, Ottawa 53"—a selection from some flax received from Ireland—has given very good results in the field and has shown itself of excellent fibre quality. A few samples of this variety were sent out last autumn and arrangements have been made to distribute a larger quantity next season. It is believed that this variety, on account of the exceptional length of its fibre, will be of great value. The yield of seed produced from it is not at all large.

A selected bean, under the name of "Norwegian, Ottawa 710," was distributed in considerable quantities this last winter. While this bean is brown and therefore lacks the attractiveness of the white varieties, it is so early in ripening and so productive that it will probably prove of considerable value in some of those districts where the season is short and for which hitherto no variety of field bean has been introduced which ripened sufficiently early.

The new pea which has already been announced, Mackay, Ottawa 25, was not distributed this season, because the stock of seed on hand was not more than was

required for propagation. Arrangements have been made by which it is hoped that a certain quantity of this variety will be available for distribution next winter. The Mackay, though somewhat late in ripening, is certainly one of the most productive peas known.

PUBLICATIONS ISSUED

Two important little bulletins were sent out during the past season. The first of these is called "The Best Varieties of Grain." In it details are given as to the varieties recommended for the different soils and climates of Canada.

The other bulletin is entitled "The Use of Coarse Grains for Human Food." Its aim is to encourage the use of oats, barley, peas, etc., as human food, on account of the advantages which they possess from a point of view of health as well as price. It was also desired to show how the cost of food in outlying districts might be reduced by the farmers growing more material which they could themselves grind for use at home.

FREE DISTRIBUTION OF SEED SAMPLES

A somewhat larger number of free samples were sent out last season than in the immediately preceding years. It is expected that the distribution will increase in amount as our stock of seed of the most desirable varieties is gradually built up. It was deeply to be regretted that several thousand applications for samples of the new hulless oat, Liberty, Ottawa 480, had to be refused. The quantity of seed on hand was not nearly sufficient to satisfy the very large and somewhat unexpected demand.

A great many applications for flax had also to be declined. This was the first season for the distribution of flax and beans. The stock of beans was quite adequate, and it is expected that a sufficient quantity of flax will be on hand next season. It is not easy to foresee just what will be the demand in any particular case and, especially when new varieties are being introduced, we are frequently unable to provide enough seed the first year.

The following tables give some details as to the distribution of this season:—

SEED DISTRIBUTION, 1919-1920. CLASSIFIED BY PROVINCES

—	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Mani- toba	Saskat- chewan	Alberta	British Columbia	Total
Oats.....	55	199	112	824	615	236	574	564	153	3,332
Wheat.....	29	132	58	593	233	185	432	455	121	2,238
Barley.....	8	61	19	455	166	83	191	184	44	1,211
Beans.....	14	105	44	268	71	50	88	127	51	818
Peas.....	3	40	24	260	165	39	111	133	44	819
Flax.....	7	13	4	116	100	70	118	49	12	489
Total...	116	550	261	2,516	1,350	663	1,514	1,512	425	8,907

MILLING AND BAKING TESTS

The number of milling and baking tests during the past twelve months was not very large owing to the fact that at the present time there is no special assistant for this work, the former milling and baking assistant occupying now the position of chief assistant and having, therefore, less time to devote to any special line of work than formerly. The study of the effect of storage on flour and wheat was continued and a few other special investigations were also made, but the greater part of the time devoted to milling and baking was given to tests of new cross-bred varieties which are intended for the large, central, wheat growing sections of Canada, where baking quality is of special importance to the reputation of the grain. A number of interesting crosses between Marquis and Prelude wheats were examined as well as some others. Altogether sixty samples of wheat were ground and 262 small loaves were baked.

DIVISION OF FORAGE PLANTS

REPORT OF THE DOMINION AGROSTOLOGIST, M. O. MALTE., PH.D.

The effects of the war still being felt in the matter of providing for an adequate supply of field root seed of the best quality being kept available in commercial quantities to the farmers of Canada, the Division of Forage Plants was in duty bound to try to secure, by emergency production, the necessary quantities of the field root seed needed. Accordingly, the production of field root seed on a commercial scale was, in the activities of the Division, given preference over other phases of work, such as plant breeding and research work in general, on the ground that immediate results, necessitated through the effect of the war on general agricultural conditions, must be considered of more vital importance to Canadian agriculture than investigations expected to bear fruit in the future. Nevertheless, and in spite of the time and energy that the providing of a commercial field root seed supply cost the Division, the necessity of preparing for constructive work of a nature calculated to be of value in years to come was realized as clearly as it was in the previous year, when, also, most of the activity of the Division had to be devoted to war emergency work. Accordingly, much was done in preparation for the resumption of the normal work coming under the scope of the Division. On account of its varied nature, it can however, not be reported upon in detail. It may be mentioned, though, that a large number of types of grasses and other forage plants were collected, the said types to be used for breeding purposes as soon as the conditions associated with the termination of the war may allow the Division to resume its normal activities.

EMERGENCY ROOT SEED PRODUCTION

In 1918, the Division of Forage Plants arranged, as stated in last year's report, to have considerable quantities of mangels, swede turnips and carrots grown for the purpose of having available a supply of roots suitable for seed growing, in case the conditions in the spring of 1919 should warrant emergency seed production. As the conditions governing the field root seed market in the spring of 1919 seemed to call for an emergency production of root seed, the division undertook, so as to enable the farmers to secure seed of the best possible quality, to plant as many roots of the most popular varieties as were available for seed production. Without going into details of the carrying through of the seed-growing programme—although many observations might be worthy of being brought to the notice of the agricultural public—the Division begs to report the production of the following quantities of marketable field root seed. In doing so, the Division wishes to state that the quantities as given below were disposed of commercially through the Markets Intelligence Division of the Seed Branch of the Dominion Department of Agriculture, with the exception of what was needed for the Farms and Stations of the Experimental Farms' System.

	Pounds
Grown at the Central Experimental Farm, Ottawa—	
Yellow Intermediate mangel.. . . .	5,605
Danish Champion carrot.. . . .	266
Grown at the Dominion Experimental Station, Charlottetown, P.E.I.—	
Yellow Intermediate mangel.. . . .	1,600
Half Sugar White mangel.. . . .	6,000
Champion swede turnip.. . . .	1,750
Grown at the Dominion Experimental Station, Kentville, N.S.—	
Canadian Gem swede turnip.. . . .	760
Kentville Green Top swede turnip.. . . .	2,283
Ditmar's Green-Bronze Top swede turnip.. . . .	3,668

SESSIONAL PAPER No. 16

BREEDING OF GRASSES AND CLOVERS

The breeding work with grasses and clovers which for the last few years has practically been at a standstill, owing to the necessity of paying particular attention to problems arising out of war conditions, was resumed. The work on the breeding material already growing at the Central Experimental Farm was continued and much new material collected.

Western Rye Grass.—As explained in last year's report, the western rye grass is, from a plant breeder's standpoint, one of the most interesting and promising grasses. It is native to Canada and occurs from the Atlantic to the Pacific, being particularly plentiful in the drier sections of the West. The western rye is one of the most complex grasses, consisting as it does of a very large number of forms, as practically no one of the characters, the sum total of which makes up the species, is a constant. The variability of the western rye is noticeable in all sections of Canada in which it is fairly common, and particularly conspicuous in the valleys of British Columbia and between the prairie proper and the lower slopes of the Rockies.

Its polymorphous character is of the greatest interest to the plant breeder, because it enables him to secure, without much difficulty, a very large collection of easily distinguishable forms of a widely different agricultural value. As the various forms, according to observations made, seem to breed true to type, a very large number of varieties can be secured simply by propagation of the forms occurring in the wild state. As, furthermore, the Western Rye grass plants are normally self-fertilized, no special precautions against possible crossings taking place need to be taken, a fact which enables the breeder to work with a large number of varieties without any danger of their deteriorating in purity through crossings.

During the season of 1918 some one hundred plants representing forms of different agricultural value were collected in Western Canada and shipped to Ottawa, where they were transplanted.

In 1919 seed was harvested from seventy-four of them. In addition, seed was harvested from seven distinct varieties developed from seed of wild plants collected at Calgary, Alberta, in 1916.

In order to secure further stock material for the development of new varieties, a large number of seed samples was collected from wild plants in the West in the late summer of 1919.

Other Grasses.—The breeding work with timothy which was discontinued during the greater part of the war was resumed, as was also the breeding work with orchard grass and meadow fescue.

In order to secure ample breeding material, a large number of samples of seed of different forms of orchard grass were collected in British Columbia, and there also were collected a few samples of forms of Kentucky blue grass and of red or creeping fescue.

ALFALFA

In 1915, the Division of Forage Plants was growing several lots of alfalfa strains developed from individual plants through self-fertilization. The lots in question were widely different from each other, but remarkably uniform within themselves. They demonstrated that it is possible to develop, in a comparatively short time, distinct varieties of alfalfa recognizable with certainty in the field.

The importance of having such varieties in the trade instead of the polymorphous and vaguely defined so-called varieties which so far are used, is apparent and arrangements were therefore made, five years ago, to continue the alfalfa breeding work on an extended scale. Unfortunately conditions did not allow the breeding work to be continued until this year when seed was secured from a small number of self-fertilized plants.

SESSIONAL PAPER No. 16

together with hot winds, and a hailstorm just before cutting time, resulted in almost a crop failure. Wheat sown April 17 ripened July 22, and oats sown April 29 ripened July 31. Cost of summer-fallowing four fields, a total of 20 acres, was \$6.44 per acre, standard, and \$10.20 per acre, actual.

	Yield per acre	Standard cost	Actual cost
		Per bush.	Per bush.
Wheat after fallow in 3-year rotation.....	1 bush. 12 lbs....	\$10 14	\$17 38
Wheat after wheat in 3-year rotation.....	36 lbs.....	15 80	26 61
Wheat after fallow in 4-year rotation.....	1 bush.....	10 12	13 19
Western rye grass in 4-year rotation .. .	No crop.		
Oats after fallow in 3-year rotation.....	5 bush. 5 lbs....	2 00	3 32
Oats after grain crop in 3-year rotation .. .	No crop.		

Carmangay.—Operator, W. H. Millar. The spring of 1919 opened early, work on the land commencing April 3. The seed went into the soil in nice shape and started away in a uniform manner. By June 29 continued dry weather, persistent attacks of gophers and blasting of heated winds had done their effective work. Rains did not follow in time to give any relief, and consequently the field crops were a total failure. Wheat was sown on April 17, and oats were sown on May 8. Cost of summer-fallowing three fields, a total of 15 acres, was \$4.90 per acre standard and \$7.21 per acre actual cost. Cost of operating the station of ten fields, a total of 50 acres, was \$4.68 per acre, standard, and \$6.84, actual.

Delacour.—Operator, G. M. McElroy. The spring of 1919 opened in good time, work on the land commencing April 10. Sufficient moisture was in the ground for a uniform germination, and the crop came along fairly well for a time. By June 24 the effects of drought and heat could be noticed upon the wheat in the colouring of under leaves. Drought continued so long that wheat was seriously injured. On August 6 a hailstorm passed over the district, taking from 25 per cent to 50 per cent of the crop that was existing. Rain coming later encouraged a second growth. Cutting was then delayed that a maximum amount might be harvested. Owing to early frost the quality was inferior, and early winter made it advisable to take this mixed growth as roughage feed. Wheat sown April 12 ripened August 27, and oats sown April 18 ripened September 20. Cost of summer-fallowing three fields, a total of 15 acres, was \$4.62 per acre, standard, and \$6.68 per acre, actual.

	Yield per acre	Standard cost	Actual cost
	lbs.	per ton	per ton
Wheat taken as roughage feed in 3-year rotation.....	1,066	\$13 97	\$21 20
Oats taken as roughage feed in 3-year rotation.....	1,200	11 25	15 98
Wheat taken as roughage feed in 4-year rotation.....	1,066	16 31	24 78
Oats replacing hay in 4-year rotation, grass seeds failing	1,200	8 86	12 62

Foremost.—Operator, P. H. Frankish. The spring of 1919 opened in fair time; seeding was in progress by April 17. Conditions at time of sowing were promising. This favourable start of grain crops was not followed by sufficient rainfall to continue them well to maturity, and in consequence of the drought and hot winds an almost complete crop failure was experienced. Wheat sown April 17 ripened July 31, gave a yield of 3 bushels per acre and was grown at a standard cost of \$3.19 per bushel and at an actual cost of \$4.87 per bushel. Cost of summer-fallowing four fields, a total of 20 acres, was \$4.49 per acre, standard, and \$6.41 per acre, actual. At this point precipitation from April to October amounted to 6.24 inches.

11 GEORGE V, A. 1921

Grassy Lake.—Operator, J. E. James. The spring of 1919 opened in good time, work on the land commencing April 12. Seed germination and start of crop was fairly uniform. Lack of rain during the growing season, hot winds and depredation of gophers, however, reduced the yield greatly, and over considerable portions of fields took the entire crop. Wheat sown April 21 ripened August 5, and oats sown April 23 ripened August 8. Cost of summer-fallowing three fields, a total of 15 acres, was \$3.77 per acre, standard, and \$5.33 per acre, actual.

	Yield per acre	Standard cost	Actual cost
Wheat after fallow in 2-year rotation.....	No crop.		
Oats after fallow in 2-year rotation.....	No crop.		
Wheat after fallow in 4-year rotation.....	8 bush.....	per bush. \$0 86	per bush. \$1 30
Oats replacing grass failure in 4-year rotation.....	14 bush.....	0 48	0 74
Western rye grass in 4-year rotation.....	No crop.		

High River.—Operator, B. F. Kiser. The spring of 1919 opened in good time, seeding being in progress by April 15. The crops made a uniform start and carried well till the 1st of June, when the need of rain became apparent. Rains did not come for some time, and through this want of moisture in midseason growth the yield of wheat was considerably reduced. Early winter interfered with the threshing operations, and oats were taken in the sheaf as feed for stock. Wheat sown April 15 ripened August 12, and oats were sown April 30. Cost of summer-fallowing two fields, a total of 10 acres, was \$3.99 per acre, standard, and \$5.35 per acre, actual.

	Yield per acre	Standard cost	Actual cost
Wheat after fallow in 3-year rotation.....	17 bush....	bush. \$0 52	bush. \$0 79
Wheat after wheat in 3-year rotation.....	2 bush....	3 22	4 82
Wheat after fallow in 5-year rotation.....	17 bush.....	0 51	0 77
Oats in the sheaf after wheat in 5-year rotation.....	1 ton 1,000 lbs...	3 89 ton	5 45
Western rye grass in 5-year rotation.....	No crop		
Alfalfa.....	1 ton	4 63	6 83

Jenner.—Operator, Jerry Fisher. The spring of 1919 opened somewhat late, work on the land not being started until the 23rd of April. The crops made a fair start and progressed for a time. At the end of June effects of drought were evident. Continued want of rain, hot winds and persistence of gophers, resulted in almost a total crop failure. Wheat sown April 24, ripened August 18 and oats were sown on May 7. Wheat gave a yield of 3 bushels per acre and was grown at a standard cost of \$2.60 per bushel and at an actual cost of \$4.16 per bushel. Oats and corn gave no crop. Cost of summer-fallowing three fields, a total of 15 acres, was \$5.40 per acre, standard, and \$8.14 per acre, actual. Precipitation at this point from April to October was 7.93 inches.

Macleod.—Operator, Norman Grier. The spring of 1919 opened in good time, work on the land being in progress by the 12th of April. Moisture in this soil was equal to a uniform germination and a fair crop start. By the middle of June the effect of drought was apparent. This adverse condition continued and was added to by hot winds and soil drift, which in much of this district resulted in complete crop failure. Owing to exceptional work upon the station a small return was obtained from certain fields. Wheat sown April 12, ripened August 25 and oats sown April 24, ripened

SESSIONAL PAPER No. 16

August 25. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.51 per acre, standard, and \$6.43 per acre, actual.

	Yield per acre	Standard Cost	Actual cost
Wheat after fallow in 2-year rotation.....	5 bush.....	\$1 97 per bush..	\$2 94 per bush.
Oats after fallow in 2-year rotation.....	10 bush....	0 94 per bush..	1 38 per bush.
Wheat after fallow in 4-year rotation.....	3 bush.....	2 74 per bush..	4 11 per bush.
Oats replacing grass failure in 4-year rotation.....	No crop		
Western rye grass in 4-year rotation.....	No crop		

Magrath.—Operator, J. A. Meldrum. The spring of 1919 opened early, work on the station fields commencing the 2nd of April. Germination and start of crop was only fair, the soil not being stored with moisture from 1918. Early dry conditions had an effect and by the 20th of June from drought, heat and gophers a serious reduction in grain yields was recognized. These unfavourable conditions continuing resulted in almost complete crop failure. Wheat sown April 15, ripened August 4, and oats were sown on May 1. One field of wheat was harvested, yielding 7 bushels and 12 pounds per acre, and was grown at a standard cost of \$1.93 per bushel and at an actual cost of \$2.84 per bushel. Cost of summer-fallowing three fields, a total of 15 acres, was \$3.84 per acre, standard, and \$5.10 per acre, actual.

Milk River.—Operator, B. L. Cornwall. The spring of 1919 opened in average time, seeding being in progress by April 17. The moisture supply was equal to good germination and gave the grain crop a fair start. Frequent showers were received during May and the fore part of June but only at one time did an appreciable quantity of rain fall. As a consequence before the end of June, from drought and heat, crops were on the verge of burning. Later there was no relief by summer rains and conditions grew worse, with the result that only a small amount of grain was harvested. Wheat sown April 17, ripened August 16, and oats sown May 13, ripened August 20. One wheat field gave a yield of 2 bushels and 30 pounds per acre and was grown at a standard cost of \$3.59 per bushel and at an actual cost of \$5.40 per bushel. Oats gave a yield of 11 bushels and 23 pounds per acre and were grown at a standard cost of 51 cents per bushel, and at an actual cost of 81 cents per bushel. Cost of summer-fallowing two fields, a total of 10 acres, was \$5.33 per acre, standard, and \$8.01 per acre, actual. Precipitation at this point from April to September amounted to 5.41 inches.

Munson.—Operator, R. R. Fraser. The spring of 1919 opened somewhat late, the first seeding being done on April 30. Moisture conditions were favourable which were partly due to retentive nature of the soil in this locality. Germination and start of crop were fairly uniform and growth continued healthy throughout the season, wheat lengthening from 10 inches to 26 inches between June 13 and July 5.

A good crop of wheat was harvested on August 27, and oats sown on May 13, were cut on August 25. The work and results on this station merit special mention in this generally poor crop year. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.44 per acre, standard, and \$6.28 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 3-year rotation.....	27 bush ..	\$0 27 per bush..	\$0 42 per bush.
Wheat after wheat in 3-year rotation.....	37 bush.....	0 23 per bush..	0 36 per bush.
Wheat after fallow in 5-year rotation.....	44 bush....	0 24 per bush..	0 37 per bush.
Oats after wheat in 5-year rotation.....	65 bush.....	0 13 per bush..	0 22 per bush.
Western rye grass in 5-year rotation.....	3 tons.....	1 87 per ton....	2 16 per ton.
Alfalfa.....	1 ton 1,333½ lbs.	6 80 per ton....	8 12 per ton.

11 GEORGE V, A. 1921

Pinebler Creek.—Operators, Messrs. Sandgren and Carlson. The spring of 1919 opened early, seeding being in progress by the 4th of April. Germination was only fair, and early in the season a lack of moisture was noticed by the drifting of the soil. The growing crop hung on persistently until the latter part of June; at this time owing to continued drought, heat, and inroads of gophers, a greatly reduced yield became apparent and the result was almost total crop failure. Wheat sown April 4, ripened August 15, and oats sown May 12, were cut on August 15. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.46 per acre, standard, and \$6.35 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 3-year rotation ..	1 bush. 12 lbs...	\$ 7 03 per bush	\$10 68 per bush
Wheat after wheat in 3-year rotation.....	1 bush. 36 lbs...	4 72 per bush.	7 47 per bush.
Wheat after fallow in 5-year rotation.....	3 bush. 24 lbs...	2 52 per bush.	3 84 per bush.
Oats after wheat in 5-year rotation ..	5 bush. 7 lbs....	1 54 per bush.	2 83 per bush.
Western rye grass in 5-year rotation	600 lbs.....	17 48 per ton..	19 13 per ton.
Alfalfa	1,333 1/3 lbs	8 97 per ton...	10 52 per ton.

Taber.—Operator, I. L. Holman. The spring of 1919 opened about the average time, seeding being in progress by April 18. Drought and soil drifting were in evidence early. Aided by snow and rain at the beginning of May, a fair recovery and some promise of crop was made up to the middle of June. From this time drought and hot winds prevailed, resulting in a very meagre stand, which was further reduced at cutting time by a hailstorm. As a consequence of these unfavourable circumstances, this district suffered an almost complete crop failure. On the station, a small return was given by certain fields. Wheat sown April 18, ripened July 28, and oats were sown on May 13. Cost of summer-fallowing three fields, a total of 15 acres, was \$4.52 per acre, standard, and \$6.41 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 2-year rotation.....	5 bush.....	\$1 94 per bush..	\$ 2 86 per bush.
Oats after fallow in 2-year rotation, taken as roughage feed.....	1,200 lbs.....	16 40 per ton...	23 95 per ton.
Wheat after fallow in 4-year rotation.....	4 bush. 36 lbs...	1 96 per ton...	3 01 per ton.
Oats as hay in 4-year rotation.....	No crop		
Western rye grass.....	No crop		

Wainwright.—Operator, G. C. Boyd. The spring of 1919 opened in average time, seeding being in progress by April 16. A scant moisture supply was early in evidence, soil becoming driftty by the end of May. By the middle of June owing to drought and heat, the wheat crop was pretty well burnt. Rains came later in the season and encouraged a second growth which when cut with the mower, made of wheat a roughage feed for stock. These late rains came in time to save part of the oat crop, permitting a threshing which gave about one-third of a fair return in grain. Wheat was sown on April 16, and oats sown April 25, ripened September 18. This being the first season for operating the station at this point, a variation in yield due to position in rotation is not seen. Wheat as roughage feed gave a yield of 1,200 pounds per acre at a standard cost of \$13.82 per ton, and at an actual cost of \$21.47 per ton. Oats gave a yield of 20 bushels to the acre and were grown at a cost of 36 cents per bushel standard and 58 cents per bushel actual cost. Cost of summer-fallowing three fields, a total of 15 acres was \$6.18 per acre, standard, and \$9.73 per acre, actual.

Whitla.—Operator, R. H. Babe. The spring of 1919 opened in average time, seeding being in progress by April 19. Moisture content of the soil was sufficient for

SESSIONAL PAPER No. 16

germination and gave the seed a uniform start. Crop growth held on fairly well until about the middle of June. By this time, the drought was having an effect, hot winds soon added their blight, gophers persistently attacked and the combined result was disastrous to the wheat. Oats were withered back to the ground. At harvest time hail further reduced what little wheat remained, resulting in an almost total failure. Wheat sown on April 19, ripened August 6, and oats were sown on May 14. Cost of summer-fallowing three fields, a total of 15 acres, was \$8.46 per acre, standard, and \$14.29 per acre actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 2-year rotation.....	2 bush.....	\$ 7 74 per bush.	\$12 86 per bush.
Oats after fallow in 2-year rotation.....	No crop		
Wheat after fallow in 4-year rotation....	2 bush...	6 45 per bush.	10 73 per bush.
Oats as hay in 4-year rotation, grass seeds failing.....	No crop		
Western rye grass in 4-year rotation.....	1,000 lbs.....	11 67 per ton...	13 78 per ton.
Alfalfa in rows.....	1 ton.....	5 58 per ton...	7 04 per ton.

Youngstown.—Operator, G. S. Coad. The spring of 1919 opened towards the end of April, seeding being in progress by April 22. The moisture supply was short, and by the 20th of May effects of drought were seen, and the destructive work of cutworms was in evidence. Drought continued and by the forepart of July, a crop failure had become a probability. Throughout July and August showers occurred on ten different dates, but the quantity of rain received at no time was effective and consequently almost a total crop failure was experienced. Wheat sown April 22, ripened August 18, and oats were sown on May 7. Wheat gave a yield of 1 bushel and 40 pounds per acre at a standard cost of \$4.75 per bushel and an actual cost of \$7.28 per bushel. Oats cut for roughage feed gave one ton per acre at a standard cost of \$8.61 per ton. Western rye grass gave a return of 1,000 pounds per acre at a standard cost of \$5.26 per ton and an actual cost of \$11.54 per ton. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.90 per acre, standard, and \$7.21 per acre, actual. Precipitation at this point from April to October amounted to 7.48 inches.

ILLUSTRATION STATIONS IN SASKATCHEWAN

Assiniboia.—Operator, P. J. H. Warren. The spring opened here a little later than usual and seeding was started April 22. There was very little moisture in the subsoil, owing to the previous dry season. There was a fair amount of moisture in the spring and all crops made a favourable start. Dry weather followed with very little rain and crops suffered considerably. Then a hailstorm in July practically destroyed all crops. Later rain caused a second growth in the oat crop, and gave a small quantity of green feed.

Biggar.—Operator, S. E. Shaw. The spring opened here about the usual time and seeding operations were started April 15. The subsoil was dry, but there was a fair amount of moisture in the spring from the snow and light showers of rain. Crops had made a good beginning when the dry weather set in and the dry winds began to blow. Late spring frost did slight damage. The winds caused the soil to drift and cut off the tender plants or covered them over. With these unfavourable conditions the result was practically a crop failure. Some small quantity of green feed was taken from some of the fields.

Three of the fields were sown to fall rye and the plan for next season is to seed the whole station down to grass, alfalfa and sweet clover to restore fibre to the soil.

11 GEORGE V, A. 1921

Davidson.—Operator, R. Lloyd. The spring opened here later than usual and seeding commenced about the latter part of April. There was a fairly good supply of moisture and the grain made a good start. The weather was dry for a time after seeding, but some good rains came in time to keep the crops growing. Wheat was harvested August 7, and oats August 19. Yields were fair. Late rains added considerably to the yield of the late oat crop. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.90 per acre, standard, and \$5.89 per acre, actual.

	Yield per acre	Standard cost	Actual cost
Wheat after fallow in 3-year rotation....	18 bush.....	\$0 67 per bush..	\$0 78 per bush.
Wheat after wheat in 3-year rotation.....	9 bush.....	1 02 per bush..	1 27 per bush.
Wheat after fallow in 5-year rotation.....	17 bush. 12 lbs..	0 70 per bush..	0 84 per bush.
Oats after wheat in 5-year rotation.....	21 bush. 20 lbs..	0 44 per bush..	0 52 per bush.
Oats where grass failed in 5-year rotation	23 bush. 20 lbs..	0 43 per bush..	0 51 per bush.
Hay in 5-year rotation.....	1,200 lbs.....	8 26 per ton....	9 01 per ton.

Herbert.—Operator, M. Holmes. The spring opened in fair time here and seeding commenced about the middle of April. Though the soil was fairly dry from the previous dry season, the seed went in under fairly good conditions, and the grain made a good start. Soon after it was up, dry weather set in and continued. Hot winds in July further dried out the soil. The result was an exceptionally early harvest and extremely light crops. Wheat was cut the first week of August. Late rains caused the late oat crop to develop and helped the feed situation. Wheat sown April 22, ripened August 4, and oats sown May 26, ripened September 9. Cost of summer-fallowing three fields, a total of 15 acres, was \$6.28 per acre, standard, and \$7.97 per acre actual.

	Yield per acre	Standard Cost	Actual cost
Wheat after fallow in 3-year rotation....	2 bush.....	\$4 83 per bush..	\$5 86 per bush.
Wheat after wheat in 3-year rotation.....	1 bush.....	7 22 per bush..	8 97 per bush.
Wheat after fallow in 4-year rotation.....	2 bush.....	4 88 per bush..	6 57 per bush.
Oats for hay where grass seeds failed.	No crop		
Oats for hay last crop in 4-year rotation.....	No crop		
Oats after fallow in 3-year rotation.....	2 bush.....	4 50 per bush..	5 67 per bush.
Oats after grain crop in 3-year rotation	No crop		

Lloydminster.—Operator, H. Hill. The spring opened about the usual time and seeding was started about the middle of April. The soil was dry from last year, but some spring showers helped this condition somewhat. Dry weather soon set in, which, with the hot winds of July, checked the growth of all crops and resulted in an early harvest and light crops. Late rains helped the oat crop, but interfered with the harvest operations. Wheat sown April 17, ripened August 20. Oats were sown May 10. Cost of summer-fallowing two fields, a total of 10 acres, was \$4.62 per acre, standard, and \$5.11 per acre, actual.

	Yield per acre	Standard cost	Actual cost
Wheat after fallow in 3-year rotation.....	10 bush. 30 lbs..	\$1 05 per bush..	\$1 26 per bush.
Wheat after wheat in 3-year rotation.....	No crop		
Wheat after fallow in 5-year rotation.....	11 bush.....	1 01 per bush..	1 21 per bush.
Oats after wheat taken as green feed in 5-year rotation.	1 ton.....	9 25 per ton....	11 57 per ton.
Oats for hay crop in 5-year rotation.....	1 ton.....	6 38 per ton....	8 26 per ton.
Hay.....	No crop		

SESSIONAL PAPER, No. 16

Madison.—Operator, Ottawa Farm Co. The spring opened here a little later than usual with a good supply of moisture. The grain made good growth on the start, but dry weather later with hot winds in July checked the growth. Later rains helped all crops, but particularly the late ones. Harvesting was started about the end of August. Wheat was sown April 26, ripened August 29. Oats were sown May 24. Cost of summer-fallowing four fields, a total of 20 acres was \$8.64 per acre, standard, and \$12.89 per acre, actual.

	Yield per acre	Standard cost	Actual Cost
Wheat after fallow in 3-year rotation.....	4 bush. 24 lbs...	\$ 2 46 per bush.	\$ 3 14 per bush.
Wheat after wheat in 3-year rotation.....	6 bush. 12 lbs...	1 56 per bush.	2 00 per bush.
Wheat after fallow in 5-year rotation.....	7 bush. 48 lbs...	1 46 per bush.	1 51 per bush.
Oats after wheat taken as green feed in 5-year rotation.	1,000 lbs.....	14 32 per ton..	17 13 per ton.
Oats for hay crop in 5-year rotation.....	1,000 lbs.....	10 12 per ton..	12 40 per ton.
Hay.....	No crop		

Maple Creek.—Operator, G. L. Hammond. The spring opened a little later than usual and there was but little moisture in the subsoil from last year. Seeding was started April 21, and the grain made a good start, as there was a fair amount of moisture early. Dry weather followed accompanied by warm winds which checked the growth, a hailstorm on June 16 completed the damage, and as a result crops here were practically a failure, a little green feed only being taken off some of the fields.

Mcota.—Operator, Walter Tait. The spring opened in fair time in this district and seeding was started about April 15. Conditions were favourable for growth at first but dry weather soon set in and continued for a long time with very little rain. During July some hot winds came which did material damage to the growing crops. As a consequence all crops were light and harvest early; wheat was cut July 30. Late rains about harvest time helped the late oat crop and the feed situation. Wheat sown April 15, ripened July 30, and oats sown May 14, ripened September 2. Cost of summer-fallowing three fields, a total of 15 acres, was \$5.19 per acre, standard, and \$6.65 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 3-year rotation.....	11 bush.....	\$1 08 per bush.	\$ 1 29 per bush.
Wheat after wheat in 3-year rotation.....	2 bush. 36 lbs..	3 86 per bush.	5 12 per bush.
Wheat after fallow in 5-year rotation.....	10 bush. 36 lbs..	1 12 per bush.	1 34 per bush.
Oats after wheat taken as green feed in 5-year rotation	1,200 lbs.....	19 69 per ton...	24 67 per ton.
Oats in place of hay crop in 5-year rotation.....	10 bush. 131 lbs.	0 69 per bush.	0 88 per bush.
Oats as green feed for hay crop.....	1,200 lbs.....	11 71 per ton...	16 04 per ton

Pambrum.—Operator, C. W. Appelgren. The spring opened here a little later than usual, seeding was started April 18. The subsoil was dry from the previous dry season, but due to a fair supply of moisture from the snow and early rains the germination was good on most of the fields. The dry weather which followed with winds dried out the soil and caused practically a failure of all crops. A small quantity of green feed was secured from some of the fields.

Prelate.—Operator W. Huxtable. The spring opened a little later than usual and seeding was started about April 20. The conditions at first were favourable and the grain made a good start. Dry weather soon followed and hot winds in July did further damage. The results was that all crops were light and harvest early, wheat being cut the first week of August. Later rains helped the late oat crop. Wheat sown April

11 GEORGE V, A. 1921

24, ripened August 4, and oats sown April 28, ripened August 9. Cost of summer-fallowing two fields, a total of 10 acres, was \$6.23 per acre, standard, and \$7.96 per acre, actual.

	Yield per acre	Standard Cost	Actual cost
Wheat after fallow in 3-year rotation.....	10 bush. 30 lbs..	\$0 94 per bush.	\$1 15 per bush.
Wheat after wheat in 3-year rotation.....	5 bush.....	1 71 per bush.	2 14 per bush.
Wheat after fallow in 5-year rotation.....	16 bush.....	0 66 per bush.	0 79 per bush.
Oats after wheat in 5-year rotation.....	16 bush.....	0 51 per bush.	0 61 per bush.
Oats for hay in 5-year rotation.....	No crop		
Alfalfa hay in 5-year rotation.....	1,000 lbs.....	7 24 per ton....	8 90 per ton.

Radville.—Operator, E. Noble. The spring opened here later than usual and seeding was started April 26. The seed went in under fair conditions though there was little moisture in the subsoil. All crops made a good growth at first, but the extremely dry weather which followed with the hot winds checked the normal development and ripened the crops early. Harvest was started on July 28, and oats were sown May 21. Cost of summer-fallowing two fields, a total of 10 acres, was \$5.30 per acre, standard, and \$7.04 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 3-year rotation....	1 bush. 36 lbs...	\$ 6 32 per bush.	\$ 8 02 per bush.
Wheat after wheat in 3-year rotation.....	1 bush.....	7 73 per bush.	9 97 per bush.
Wheat after fallow in 5-year rotation.....	3 bush. 36 lbs...	2 87 per bush.	3 58 per bush.
Oats after wheat taken as green feed in 5-year rotation	1,200 lbs.....	15 52 per ton...	20 68 per ton.
Oats as green feed for hay crop.....	800 lbs.....	26 29 per ton...	35 46 per ton.
Hay, rye grass ..	800 lbs.....	13 26 per ton...	13 85 per ton.

Shaunavon.—Operator, Neil McLean. The spring opened here a little later than usual, and there was not much moisture in the subsoil owing to the dry season of 1918. Seeding was started April 25 and some showers helped to start germination so that the wheat made a good start and oats fair. Dry weather with warm winds soon set in and continued through the growing season with scarcely any rain. The crops were practically a failure, only a small quantity of green feed being taken from some of the fields.

Tugaska.—Operator, R. Wilson. The spring was later than usual in this district and seeding of wheat on the Station was started May 2. There was a good supply of moisture and a fine firm seed bed. All grain made a good start, but dry weather later delayed the growth somewhat, but rains came in time to prevent much damage. Crops were fairly good and harvest was early, both wheat and oats matured by August 7. Wheat sown May 2, ripened August 7, and oats sown May 9, ripened by August 7. Cost of summer-fallowing two fields, a total of 10 acres, was \$5.62 per acre, standard, and \$7.01 per acre, actual.

	Yield per acre	Standard cost	Actual Cost
Wheat after fallow in 3-year rotation.....	18 bush. 48 lbs..	\$0 65 per bush..	\$0 76 per bush.
Wheat second field crop in 3-year rotation.....	15 bush. 48 lbs..	0 74 per bush..	0 87 per bush.
Wheat after fallow in 5-year rotation.....	16 bush. 12 lbs..	0 73 per bush..	0 85 per bush.
Oats after wheat in 5-year rotation.....	38 bush. 13 lbs..	0 31 per bush..	0 32 per bush.
Hay in 5-year rotation.....	1 ton ..	5 62 per ton....	6 54 per ton.
Hay in 5-year rotation ..	1 ton.....	5 62 per ton....	6 54 per ton.

SESSIONAL PAPER No. 16

Weyburn.—Operator, E. Meredith. The spring opened here a little later than usual with a fairly good supply of moisture. Seeding was started about April 20, and the grain germinated well. Weyburn experienced one of the driest years in her history, and as a result, harvest was early, and crops light. Cutting of wheat was started on July 30. Late rains helped the late oat crop and thus relieved the feed situation. Wheat sown April 22, ripened July 30, and oats sown May 17, ripened August 11. Cost of summer-fallowing two fields, a total of 10 acres, was \$5.09 per acre, standard, and \$7.37 per acre, actual.

	Yield per acre	Standard Cost	Actual Cost
Wheat after fallow in 3-year rotation.....	6 bush. 30 lbs..	\$1 63 per bush..	\$2 09 per bush.
Wheat after wheat in 3-year rotation.....	6 bush 30 lbs...	1 39 per bush..	1 81 per bush.
Wheat after fallow in 5-year rotation.....	6 bush.....	1 53 per bush..	2 07 per bush.
Oats after wheat in 5-year rotation.....	24 bush. 17 lbs..	0 35 per bush..	0 44 per bush.
Oats in place of hay in 5-year rotation.....	26 bush.....	0 34 per bush..	0 42 per bush.
Oats in place of hay in 5-year rotation.....	27 bush. 17 lbs..	0 30 per bush..	0 39 per bush.

Zealandia.— Operator, W. M. Roberts. The spring was later than usual here and seeding of wheat was started April 24, and oats May 19. The seed went in under favourable conditions and the growth at first was promising but the season was so dry with hot winds in July that all crops suffered and were very light. Harvest was started on August 20. Late rains caused considerable new growth in the late oat crop. Wheat and oats were in the shock when the early snow came and winter set in. Cost of summer-fallowing three fields, a total of 15 acres, was \$5.51 per acre, standard, and \$0.90 per acre, actual.

ILLUSTRATION STATIONS IN QUEBEC

Aubrey, Chateauguay county.—Operator, Samuel Reddick. Four-year rotation.

Field A.—Clover hay and seed. Yielded 2½ tons of hay first cutting; actual cost \$4 per ton and standard cost \$3.30 per ton. There were 200 pounds of seed per acre, at an actual cost of 6 cents per pound and a standard cost of 6 cents per pound.

Field B.—Hay, two crops. Yielded 4 tons per acre, at an actual cost of \$2.68 per ton, the standard cost being \$2.66 per ton. .

Field C.—Banner oats. Yielded 26 bushels per acre, at an actual cost of 68 cents per bushel and a standard cost of 59 cents per bushel. Straw estimated at 1,000 pounds per acre, at \$6 per ton.

Field D.—Corn. Estimated yield 7.9 tons per acre; actual cost, \$4.34 per ton, standard cost, \$4.30 per ton.

It will be noticed that yields of grain and corn are very low. This is due to the late spring and to the excess moisture in the soil. This land affords an excellent opportunity for a tile drainage illustration.

The actual cost of manual labour was 20 cents per hour and for horse labour 7½ cents per hour.

As a result of the illustration work, Mr. Reddick has sold \$1,500 worth of clover seed.

Cap Chat, Gaspé County.—Operator, Chas. F. Roy. Four-year rotation.

Field A.—Banner oats. Yielded 44½ bushels per acre. Estimated yield of straw, 4,000 pounds. Actual cost of oats 22 cents per bushel, standard cost being 19 cents per bushel.

Field B.—Oats. Yielded 44½ bushels per acre. Straw estimated yield, 4,000 pounds. Actual cost of oats, 22 cents per bushel, standard cost, 19 cents per bushel.

11 GEORGE V, A. 1921

Field C.—Banner oats. Yielded 44½ bushels per acre. Estimated yield of straw, 1,000 pounds. Actual cost of oats, 22 cents per bushel, standard cost, 19 cents per bushel.

Lachute, Argenteuil County.—Operator, S. E. Smith. Four-year rotation.

Field A.—Clover Hay. Estimated yield, 3 tons per acre. Actual cost, \$3.91 per ton, standard cost, \$3.74 per ton. A second crop was taken off this field for seed, which crop gave a yield of 113½ pounds per acre.

Field B.—Banner oats. Yield 29½ bushels per acre. Straw gave an estimated yield of 1,500 pounds per acre. Actual cost of oats, 45 cents per bushel, standard cost, 37 cents per bushel.

Field C.—Corn. Estimated yield 16 tons per acre. Actual cost, \$2.66 per ton, standard cost, \$2.46 per ton.

Field D.—Pasture.

Charges for labour: Actual cost of manual labour, 21½ cents per hour, for horse labour, 10 cents per hour. Standard cost of manual labour, 20 cents per hour, for horse labour, 7 cents per hour.

Lac à la Tortue, Champlain County.—Operator, S. T. Lupien. Four-year rotation.

Field A.—Timothy hay. Estimated yield, 1¼ tons per acre; actual cost, \$10.15 per acre or \$ 8.12 per ton, standard cost, \$9.68 per acre or \$7.74 per ton.

Field B.—Banner oats. Yielded 15 bushels per acre. Straw yielded 1,500 pounds per acre. Actual cost of oats, 78 cents per bushel, standard cost, 55 cents per bushel.

Field C.—Clover hay. First crop yielded 50 pounds clover seed per acre and 1,500 pounds straw which was used as fodder. The actual cost was \$6 per bushel and the standard cost \$5.40 per bushel.

Field D.—Corn. Estimated yield, 11.42 tons per acre. Actual cost, \$3.52 per ton, standard cost, \$3.13 per ton. Estimated cost of manure used, \$15 per acre. Height of corn between six and seven feet.

The soil on this Station is very light sand but splendid results are being obtained and the land is gradually improving.

The second turn of the four-year rotation is now started on this Station and crops are increasing.

Montmagny, Montmagny County.—Operator, F. G. Fournier. Four-year rotation.

Field A.—Banner oats. Yielded 29½ bushels per acre. Estimated yield of straw, 2,600 pounds per acre. Actual cost of oats, 46 cents per bushel, standard cost 38 cents per bushel.

Field B.—Clover hay. Estimated yield, 1½ tons per acre. Actual cost, \$6.50 per ton, standard cost, \$6.34 per ton.

A crop of seed was grown on this field.

Field C.—Banner oats. Yielded 20 bushels per acre. There were 2,600 pounds of straw. Actual cost of oats, 70 cents per bushel.

Field D.—Hay. Estimated yield, 1¼ tons per acre. Actual cost, \$8.32 per ton, standard cost, \$8.11 per ton.

A heavy hailstorm damaged the grain crop on the Station, lessening the yields about one-half.

New Carlisle, Bonaventure County.—Operator, E. M. Legallais. Four-year rotation.

Field A.—Hay. Estimated yield, 3 tons per acre. Actual cost, \$4.61 per ton, standard cost, \$4.53 per ton.

Field B.—Oats. Yielded 53 bushels per acre, actual cost being 41 cents per bushel, standard cost, 37 cents per bushel. Straw yielded 1,500 pounds.

Field C.—Potatoes. Yielded 350 bushels per acre. Actual cost, 47 cents per bushel, standard cost, 46 cents per bushel.

SESSIONAL PAPER No. 16

Field D.—Hay. Estimated yield 3 tons per acre. Actual cost, \$4.61 per ton, standard cost, \$4.53 per ton.

The actual cost of manual labour was 20 cents per hour and of horse labour 10 cents per hour.

An application of fish was applied to Field D and gave very good results.

New Richmond, Bonaventure County.—Operator, J. B. Cyr. Four-year rotation.

Field A.—Hay. Estimated yield, 1 ton per acre. Actual cost, \$11.21 per ton, standard cost, \$9.91 per ton. This field was seeded before the illustration work was commenced.

Note the difference in yield and cost later.

Field B.—Banner oats. Yielded $31\frac{1}{4}$ bushels per acre. Estimated yield of straw, 1,000 pounds. Actual cost of oats, 62 cents per bushel, standard cost, 41 cents per bushel.

Field C.—Banner oats. Yielded $31\frac{1}{4}$ bushels per acre. Estimated yield of straw, 1,000 pounds. Actual cost of oats, 51 cents per bushel, standard cost, 38 cents per bushel.

Field D.—Hoed crops. Turnips: Yield, $18\frac{1}{2}$ tons per acre; actual cost, \$2.88 per ton, standard cost, \$2.18 per ton. Corn: Estimated yield, $12\frac{1}{2}$ tons per acre; actual cost, \$4.57 per ton, standard cost, \$3.54 per ton.

Charges for labour: actual cost of manual labour, 30 cents per hour, for horse labour, 15 cents per hour. Standard costs: 20 cents per hour for manual labour and 7 cents per hour for horse labour.

Rimouski, Rimouski County.—Operator, Nazaire Begin. Four-year rotation.

Field A.—Potatoes. Yielded 250 bushels per acre. Actual cost, 39 cents per bushel, standard cost, 32 cents per bushel. Fish was used as a fertilizer on this field.

Field B.—Hay. Estimated yield, 2 tons per acre. Actual cost, \$4.72 per ton, standard cost, \$4.46 per ton.

Field C.—Banner oats. Estimated yield, 40 bushels per acre. Straw yielded 1,700 pounds per acre. Actual cost, 37 cents per bushel, standard cost, 35 cents per bushel.

Field D.—Hay. Estimated yield, $1\frac{1}{2}$ tons per acre. Actual cost, \$8.32 per ton, standard cost, \$7.65 per ton.

Three-year rotation.

Field A.—Pasture.

Field B.—Hoed crop. Potatoes: Yielded 355 bushels per acre. Actual cost, 45 cents per bushel, standard cost, 41 cents per bushel. Turnips: Yielded 475 bushels per acre. Actual cost, 15 cents per bushel, standard cost, 12 cents per bushel. Corn: Estimated yield 10 tons per acre. Actual cost, \$5.41 per ton, standard cost, \$4.75 per ton.

Field C.—Banner oats. Yielded 53 bushels per acre and 1,700 pounds of straw per acre. Actual cost of oats, 31 cents per bushel, standard cost, 24 cents per bushel.

Stanbridge East, Missisquoi County.—Operator, C. S. Moore. Four-year rotation. Drained Land.—

Field A.—Banner oats.—Yielded 33.8 bushels per acre. Straw estimated at 1,500 pounds per acre. Actual cost of oats, 42 cents per bushel, standard cost, 32 cents per bushel.

Field B.—Hoed crop. Turnips yielded $15\frac{1}{4}$ tons per acre, at an actual cost of \$3.05 per ton, the standard cost being \$2.92 per ton. Mangels yielded $21\frac{1}{2}$ tons per acre, actual cost being \$2.16 per ton, standard cost, \$2.07 per ton.

Field C.—Hay. Estimated yield 1.9 tons per acre, at an actual cost of \$5.87 per ton, standard cost of \$5.58 per ton.

11 GEORGE V, A. 1921

Field D.—Hay. Estimated yield 2.7 tons per acre. Actual cost, \$4.83 per ton, standard cost, \$4.47 per ton.

Undrained Land.—

Field E.—Hay. Estimated yield 1 2/5 tons per acre. Actual cost, \$9.14 per ton, standard cost, \$8.62 per ton.

Field F.—Hay. Estimated yield 1 2/5 tons per acre, actual cost being \$3.95 per ton standard cost, \$8.53 per ton.

Field G.—Corn. Estimated yield, 7 tons per acre. Actual cost being \$3.95 per ton, standard cost, \$5.17 per ton.

Field H.—Banner oats. Yielded 31½ bushels per acre, 1,500 pounds straw. Actual cost, 45 cents per bushel of oats, standard cost, 37 cents per bushel.

The actual cost of manual labour was 18 cents per hour; of one horse, 33 cents per hour, and of a two-horse team, 48 cents per hour, including man. Standard cost of manual labour, 20 cents per hour, of horse-labour, 7 cents per hour.

NOTE.—In 1918 seed sown on drained land produced 24.09 bushels more than that sown on undrained land. Taking \$1 as price of seed per bushel, the difference is \$24.09.

It will be noticed that the difference has not been so great in 1919, the reason being the special preparation of the land and the exceptionally favourable weather for crop production on low lands.

St. Julie, Verchères County.—Operator, L. Hebert. Four-year rotation.

Field A.—Banner oats. Yielded 46 bushels per acre with 1,500 pounds of straw, at an actual cost of 30 cents per bushel, the standard cost being 25 cents per bushel.

Field B.—Hoed crop. Corn: Estimated yield of 14 tons per acre, at an actual cost of \$3.26 per ton and a standard cost of \$2.99 per ton. Swedes: Yielded 7½ tons per acre, actual cost being \$3.26 per ton and a standard cost of \$2.99 per ton.

Field C.—Clover Hay. Estimated yield 3½ tons per acre, actual cost being \$4.08 per ton, standard cost, \$3.57 per ton.

This field yielded 93 pounds of clover seed per acre, at a cost of 11 cents per pound, making a profit of \$45.57 per acre.

Field D.—Hay. Estimated yield per acre 1½ tons; actual cost, \$6.38 per ton, standard cost, \$6.22 per ton.

Charges for labour: actual cost of manual labour 22½ cents per hour, horse labour 10 cents per hour.

St. Gedeon, Chicoutimi County.—Operator, Wilfred Simard. Four-year rotation.

Field A.—Hay. Estimated yield, 2½ tons per acre. Actual cost, \$4.32 per ton, standard cost, \$3.88 per ton.

Field B.—Banner oats.—Yielded 23 bushels per acre. Straw estimated at 1,000 pounds per acre. Actual cost, 54 cents per bushel, standard cost, 44 cents per bushel.

Field C.—Potatoes. Yielded 246 bushels per acre; actual cost, 40 cents per bushel, standard cost, 35 cents per bushel.

Field D.—Hay. Estimated yield 1½ tons per acre; actual cost, \$7.65 per ton, standard cost, \$7.38 per ton.

Charges for labour: Actual cost of manual labour, 23 cents per hour, for horse labour, 10 cents per hour. Standard cost for comparison: manual labour, 20 cents per hour, horse labour, 7 cents per hour.

St. Clet, Vaudreuil County.—Operator, L. Besner. Four-year rotation.

Field B.—Corn. Yielded 12 tons per acre. Actual cost, \$2.67 per ton, standard cost, \$2.60 per ton. Actual cost of oats, 49 cents per bushel, comparative or standard cost, 45 cents per bushel.

Field B.—Corn. Yielded 12 tons per acre. Actual cost, \$2.67 per ton, standard cost, \$2.60 per ton.

SESSIONAL PAPER No. 16

Field D.—Hay. Yielded $2\frac{1}{2}$ tons per acre. Actual cost, \$2.37 per ton, standard cost, \$2.31.

The oats suffered greatly from rust.

L'Assomption, L'Assomption County.—Operator, J. Papin. The land at L'Assomption is in preparation for commencing a four-year rotation in 1920.

ILLUSTRATION STATIONS IN QUEBEC, 1920

Illustration Stations which will be in operation in 1920 have been selected at the following points in Quebec:—

Buckingham, Ottawa county. Operator, E. Brady.
 St. Etienne des Gres, St. Maurice county. Operator, T. Bournival.
 St. Tite, Champlain county. Operator, N. Delisle.
 Pierreville, Yamaska county. Operator, S. Traversy.
 Weedon, Wolfe county. Operator, J. Allard.
 Plessisville, Megantic county. Operator, E. Jutras.
 St. Casimir, Portneuf county. Operator, E. St. Germaine.
 St. Malachie, Dorchester county. Operator, R. Tremblay.

ILLUSTRATION STATIONS IN NOVA SCOTIA, 1920

Illustration Stations have been selected at the following points in Nova Scotia, and will be in operation in 1920:—

Big Baddeck, Victoria county. Operator, J. A. Kiley.
 Kennetcook, Hants county. Operator, Norman Neil.
 Mabou, Inverness county. Operator, Duncan Boyle.
 New Glasgow, Pictou county. Operator, Geo. Fraser.
 Sydney, Cape Breton county. Operator, Daniel Morshead.
 Tatamagouche, Colchester county. Operator, Galvin Clark.

ILLUSTRATION STATIONS IN NEW BRUNSWICK, 1920

Illustration Stations have been selected at the following points in New Brunswick, and will be in operation in 1920:—

Apohaqui, King's county. Operator, Jas. Manchester.
 Middle Coverdale, Albert county. Operator, H. E. Mitton.
 Millville, York county. Operator, P. Graham.
 Rexton, Kent county. Operator, J. D. Dickinson.
 Woodstock, Carleton county. Operator, E. W. Turner.

DIVISION OF EXTENSION AND PUBLICITY

REPORT OF THE OFFICER IN CHARGE, W. A. LANG

The work of the Division of Extension and Publicity during the past year consisted, as in previous years, in the preparing and staging of exhibits at fall fairs, poultry shows, seed fairs and corn shows, etc., in the distribution of literature at these different exhibitions, and in attending to applications for literature, which have been received through the mails and at exhibitions and fairs during the year.

11 GEORGE V, A. 1921

Early in 1919 the chief of the division was sent by the Department of Trade and Commerce with a combined exhibit to the Industrial Fair at Lyons, France, and was absent from Canada until August.

The exhibit from the Department of Agriculture, Canada, to the Lyons Fair consisted of a display of Canadian apples, whose size, variety, and colour evoked the highest admiration; grapes, pears, and peaches, preserved in alcohol in transparent glass jars were also a notable addition to the fruit display. Sheaf samples of Canadian grains, specimens of flax, hemp, wool, flour, etc., were also exhibited and to add to the attractiveness of the exhibit large lighted transparencies were used to illustrate such subjects as Canadian sheep-rearing, wheat fields, fruit-growing, etc.

A general exhibit was prepared at the Central Farm and sent out to cover the provincial fairs in Western Canada, held at Regina, Calgary, Edmonton, Saskatoon, and Brandon. This exhibit was supplemented by local exhibits from the Branch Farm in the district in which the exhibition was held.

Exhibits consisting of recommended old and new varieties of cereals, models of poultry houses and equipment, models of live-stock buildings, together with attractive backgrounds with instructive legends and coloured transparencies, were prepared at Ottawa and sent to the following places in Ontario: Woodville, Orangeville, Listowel, Mitchell, Milverton, Thorndale, Avonmore, Newington, Norwood, Bowmanville, Metcalfe, and Russell. Larger exhibits of the same style were staged at London and Ottawa exhibitions.

During the fall and winter months, a special poultry exhibit was sent to the poultry shows at Toronto, Niagara Falls, Sarnia, Owen Sound, Peterborough, Paris, Oakville, Beamsville, St. Catharines, and Pictou. This exhibit was an arrangement of pillars holding coloured transparencies of different varieties of fowl, poultry houses, etc., appropriate legends, display of different poultry feeds, and models of poultry houses and appliances, etc., that had been given a trial and found satisfactory on the various Branch Farms. Live fowl were also exhibited with timely hints for their care and management.

A special grain exhibit, emphasizing corn-growing in western Ontario, was staged at the Chatham Corn Show.

As the same exhibit structures had been at some of the Branch Farms for a number of years, it was thought advisable to have these changed, and during the month of January the structures from Saskatchewan, Alberta, and British Columbia were assembled at Lethbridge, where the British Columbia exhibits were repaired, revarnished, and the legends changed to suit the Prairie Provinces, and the prairie structures changed to suit British Columbia. They were then reshipped to the different Farms.

During the fair season in the different provinces, each Farm was made a centre from which exhibits were sent out. Local material such as grain, threshed, and in the sheaf, grasses, flowers, fruit, etc., were added to the models and structures at the Branch Farms, and thus a complete exhibit was staged as follows:—

Charlottetown, Experimental Station exhibited at Charlottetown, Souris, Georgetown, and Summerside; Fredericton Station at Fredericton, Woodstock, and Chatham; Nappan Farm at Oxford and Shubenacadie; Lennoxville Station at Sherbrooke, Brome, and Ste. Scholastique; Cap Rouge Station at Three Rivers, Quebec City, St. Romuald, St. Michel, and Baie St. Paul; Morden Station at Plenty, Zealandia, Alsask, Kindersley, Bounty, Maclin, Lussland. At the Brandon Farm live-stock exhibits were sent to the provincial summer and winter fairs at Brandon, and championship and other prizes were won. The Indian Head Farm sent exhibits to the Regina summer and winter fairs, Sintaluta, Indian Head, and the Swift Current poultry show. In British Columbia, the Summerland Station exhibited at Kamloops, Armstrong, Kelowna, New Westminster, Peachland, Penticton, Naramata, Summer-

SESSIONAL PAPER No. 16

land; Invermere Station at Cranbrook, Creston, Nelson, Trail, Kaslo; the Sidney Station at Vancouver, New Westminster, Duncan, and Kamloops; and Agassiz Farm contributed to the combined exhibit at New Westminster and Vancouver.

Due to the scarcity of help at some of the Farms and Stations, it was found impossible to do any exhibition work.

During the year, a large number of applications for literature, both exhibition circulars and bulletins, were received and attended to by the division.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

THE SEASON

The winter of 1918-19 was exceptionally mild. The "freeze-up" occurred on November 26, and sufficient snow for sleighing fell early in December. This remained on the ground throughout the winter. There were very few storms, and no heavy thaws. The month of April was cold and backward. The fields were dry enough to plough, but were not fit to seed until after the middle of May. The grass wintered well, and gave excellent crops of hay and pasture. No frost occurred in June, which was very unusual. June and July were very favourable for all crops except corn, which started slowly. Haymaking was somewhat retarded by rainy weather, but most of the crop was saved in good condition. Grain crops were so heavy that considerable lodging occurred. September was a very favourable harvest month, and the grain went in the barns in splendid shape. Potato tops were first killed by a frost on the 15th of September. The fruit crop was above the average. October was showery, but favourable for autumn work. The first killing frost occurred on the 8th of October. Potatoes, which were a heavy crop, were stored in good condition. The pastures remained good late into the autumn. A severe frost occurred on the 16th of November, but the plough was still going at the end of the month, and winter did not commence until about the middle of December, when a very severe cold wave sent the thermometer down to 14 degrees below zero. January and the first half of February were exceptionally cold, with very little sunshine. A heavy gale occurred on the 19th of February, which unroofed a great many barns and broke a great many trees. The thaw that occurred at this time rendered the country roads impassable for several days. The first part of March was cold, and it was not until the 23rd that the snow cleared off the fields. Another heavy freshet occurred on that date, destroying a great many mill-dams.

11 GEORGE V, A. 1921

METEOROLOGICAL RECORDS—1919-20

	Temperature Fahrenheit					Total Inches	Bright Sunshine Hours
	Maximum		Minimum		Mean		
	Date	Degree	Date	Degree	Degree		
1919							
April...	25 & 28	55	10	23	37.965	4.09	100.2
May.....	24	74	2	27	47.903	2.91	215.2
June	26	83	2	34	59.233	2.22	230.5
July...	5 & 18	81	9	39	64.064	3.29	208.9
August	5 & 6	78	12	41	63.915	4.13	209.3
September.....	22	75	16	36	56.95	4.78	151.2
October.....	1	65	21 & 31	26	44.048	3.71	113.8
November.....	30	55	29	10	26.683	3.17	52.
December.....	1	55	17	-14	19.112	2.60	86.1
1920							
January.....	18	35	31	-17	8.115	1.45	87.9
February.....	6	44	1	-15	20.517	4.81	73.2
March.....	26	60	3	-7	29.483	4.75	130.4
Totals.						41.91	1,658.7

LIVE STOCK

Horses

The draught horses at this Station at the close of the year, consisted of 3 pure-bred Clydesdale mares, one Clydesdale foal and a Clydesdale gelding, 3 grade draught mares, a grade draught gelding, and in addition to these, one express horse. During the year, 2 grade draught mares were purchased, and the driving mare sold in the autumn to provide stable room for the other horses. The horses are in a good healthy condition, and ready for the spring work.

Dairy Cattle

During the year 5 pure-bred Ayrshire cows were purchased for the Station: Diana, No. 39321, Sylvia of Glenholm, No. 42135, Buttercup of Glenholm, No. 56491, Pandora of Glenholm, No. 35104, and Lily of Melrose, No. 30634. These, with Lily Helen, No. 53710, and her calf, Ravenwood Victoria, No. 66314, and the Ayrshire bull Ottawa Ivanhoe, No. 60140, constitute our pure-bred Ayrshire herd. The grade cow "Jessie" was slaughtered during the year, as she had reacted to the tuberculin test.

Beef Cattle

Four pens of cattle were purchased December 1, 1919, and fed an equal amount of hay, turnips and grain for 115 days. Pen I were scrub, dry cows, Pen II were Shorthorn and Shorthorn grade cows, Pen III were grade Shorthorn steers and Pen IV were grade dairy steers. The following table gives the purchase price, weights, gains, sale price, cost of feed, total cost and profit or loss.

SESSIONAL PAPER No. 16

BEEF FEEDING EXPERIMENTS

No. of pen	Weight Dec. 1, 1919	Weight Mar. 24, 1920	Gain	Cost per cwt. Dec. 1	Average sale price per cwt. Mar 24	Range of price for similar stock, Toronto, Mar. 24, per cwt.	Cost of feed	Total cost	Profit or loss
I.	3,560	3,900	340	\$8 62	\$11 35	\$10 00 to \$10 50	\$ 162 27	\$ 469 14	*\$26 69
II ...	4,285	4,780	495	9 50	11 55	10 50 to 11 00	162 27	569 35	*17 36
III.	3,690	4,585	895	10 00	12 88	12 00 to 12 50	162 27	531 27	59 38
IV	3,340	4,190	850	9 85	12 52	11 50 to 12 00	162 27	491 26	33 46
Totals....	14,875	17,455	2,580	9 49 average	12 08 average	11 25 average	649 08	2,061 02	48 79

*Loss

From this experiment it is evident that in Prince Edward Island, where dry cows bring a high price for fox feed in the autumn, it does not pay to try to fatten them. The average loss per Shorthorn grade cow was \$4.34, and the average loss on the scrub dry cow was \$6.67. On the other hand it does pay to feed a good type of steers. The Shorthorn grade steers gave a profit of \$14.85 and the dairy grade steers a profit of \$8.36 each. •

Swine

The three grade sows were fattened and marketed. The breeding sows were wintered in a hog cabin 8 feet by 10 feet. One sow contracted pneumonia and died. Heavy storms had blocked up the runway so that she did not have enough exercise. The others came through in good shape and gave litters averaging 8 pigs each.

An experiment in feeding wheat screenings to pigs over two months old, indicated that a considerable amount or about one-third screenings could be safely substituted for mill feeds.

POULTRY

The poultry plant was enlarged to include more yard space so that the chickens could run on new ground. Seven additional contest houses were built. These were used for rearing chicks during the brooding season.

The total number of chicks hatched in March, April and May, 1919, was 2,032. Of these, 801 were sold when a day old, 907 were reared to maturity with a death loss of 324; 367 pullets were transferred to the laying pens, cockerels were sold for breeding stock or retained for mating in the breeding pens. There were 43 culls and 449 broilers and chickens that sold at an average of 75 cents each.

A Record of Performance was kept of all the birds on the Station and those that made the best records were used as breeding stock.

The eleven laying and breeding pens were made up of 79 hens and 337 pullets as follows:—

	Pullets	Hens	Males
S.C. White Leghorns	262	58	18
Barred Plymouth Rocks	75	21	14

The first Dominion Egg Laying Contest was completed on September 30, 1919, with the pen owned by Mr. H. H. Downton first in the heavy class for the largest revenue from sale of eggs over cost of feed. Mr. Thomas J. Adamson of Laurel, P.Q., was second in this class. In the light class, Mr. C. B. Chapman's pen of Amherst,

11 GEORGE V, A. 1921

N.S., was first, with Mr. W. J. Pickard's pen of Wetaskiwin, Alta., second. Mr. T. J. Adamson won the cup for the hen laying the largest number of eggs during the contest, size and weight being considered. Mr. W. E. B. Tait's hen of Dorchester, N.B., was second, and Mr. C. B. Chapman's hen third. Rev. J. J. McDonald won first place for the best Prince Edward Island pen.

The Barred Plymouth Rock pens led in production and also in average per bird. Thirty-seven birds qualified for Record of Performance.

Twenty-two pens of ten birds each are entered in the 1919-20 Prince Edward Island Egg Laying Contest, which will be conducted for 52 consecutive weeks. There are nine pens of Barred Plymouth Rocks, eight pens of White Leghorns, two pens of White Wyandottes, and one each of Rhode Island Reds, Silver Wyandottes and Speckled Sussex. There are sixteen pens from Prince Edward Island, four from Nova Scotia and two from Quebec.

BEES

The two colonies of Italian bees increased to four during the summer. These were wintered in a four-colony case out of doors. One colony was lost while moving it late in the autumn by the combs melting down with heat generated by a very strong colony on a warm day. The others wintered well without artificial feeding. An Act for the Prevention of Infectious and Contagious Diseases and for Instruction in Bee-keeping, was prepared for the Provincial Government and passed at the session of 1920.

FIELD CROPS

The field crops on the rotations gave the following average yield per acre:—

	Aeres	Bushels	Pounds
Barley, Charlottetown No. 80	3	51	9
Oats, Banner	2	69	21
Wheat	3	26	20
Potatoes	3½	235	21
		Tons	
Mangels	1	17	1,175
Turnips	1	12	960
Clover hay	13	2	378
Timothy hay	3	2	1,382

CULTURAL PLOTS

The cultural work on over three hundred plots was continued. The season was favourable and much valuable data were obtained.

CEREALS

Twenty-five varieties of cereals were tested in duplicate on uniform test plots, and records of habit of growth and yields recorded. Mass selection is carried on each year using the uniform test plots for the hand selected plots under the Canadian Seed Growers' Association regulations. Multiplying plots are grown each year from this seed. They are carefully rogued and the seed inspected by a Canadian Seed Growers' Association inspector before it is sold to farmers. Two varieties of wheat deserve special mention, viz., Early Red Fife, which over a period of many years has shown itself to be well suited to this province, and Huron, a bearded sort of hard wheat, that withstands the wheat scab and glume spot diseases better than most other sorts.

Banner oats, that is so favourably known throughout the province, is a good reliable sort and merits first place, which it now holds. Daubeney, an early ripening variety, gave a full crop for the first season in many years.

SESSIONAL PAPER No. 16

The barley crop shows a considerable increase and the demand for a late ripening barley is increasing. For this purpose the Charlottetown No. 80, a deciduous awned, two-row sort is strongly recommended. It ripened in 102 days, or at the same date as Banner oats. This sort is now largely sown in the province, replacing the six-row varieties with the tenacious awns. It seems probable that the 62 per cent increase in acreage and the 15.8 per cent of increase in the yield throughout the province may be attributed to this most promising sort which was originated at this Station. The O.A.C. No. 21 maintained its position as one of the best of the six-row sorts.

FORAGE CROPS

Roots

Fifty-five lots of mangels were sown in uniform test plots to test out commercial seed from different sources. The home-grown seed from the different provinces did not show up as favourably as usual. Home-grown seed had led in yield for a number of years, but in 1919 the best was thirty-seventh in our list.

The turnips were quite badly injured by club-root wherever grown without a liberal application of lime. Sugar beets gave an average yield. The carrots were almost completely destroyed by the carrot rust fly.

Corn

The season was unfavourable for ensilage corn. Very few varieties matured beyond the tasseling. The average yield was $6\frac{3}{4}$ tons.

Grass and Clover Mixtures

The following general conclusions have been arrived at after observing 28 grass and clover mixtures for four seasons: Timothy is the standard hay grass, western rye grass is unsuitable for Prince Edward Island, orchard grass and meadow fescue are both promising pasture grasses, sown either alone or together, with or without clover. Tall oat grass fails to persist after the first year and is of doubtful value. Kentucky blue grass is unsuitable to land infested with natural grasses, but on clean land with clover it did fairly well. Red top is a vigorous persistent grass naturally adapted to the soil, and once started it keeps gaining in strength and vigour. Its value, however, is as a bottom grass for pasture purposes and the present commercial sort could be greatly improved if special pasture strains with thick bottom growth were developed.

Root Seed Production

Root seed was produced on a commercial scale and a satisfactory yield obtained. The seed did not mature quite as evenly as we would like to have had it, and it was slightly undersized. The following quantities were grown and sent to the Central Experimental Farm for recleaning with the best machinery:—

Name	Pounds
Half Sugar White mangel.. . . .	11,363
Yellow Intermediate mangel.. . . .	1,747
Yellow Intermediate mangel (Charlottetown selection).. . . .	1,060
Champion Swede turnip.. . . .	2,286

HORTICULTURE

Tree Fruits

The orchards of apple, cherry and plum which have grown slowly since planting in 1910 did very much better in 1919. It was found that the young trees had been lifted by the frost the first few years and that the roots were too close to the surface. The remedy applied was the ploughing of soil towards the trees and the banking of the individual trees to some extent with soil. The result has been marked in the growth. The pear orchard which was moved and reset more deeply a number of years ago, has grown much better than the other orchards. The orchards were sprayed regularly and kept free from disease and insects. A small proportion of the trees fruited and gave fruit of good quality.

Small Fruits

Prince Edward Island is adapted to the production of small fruits and the many varieties of strawberries, raspberries, gooseberries, and currants did well. Raspberries regularly produce a full crop if given reasonable attention, and the demand for this fruit is much greater than the supply.

Trees, Shrubs, Flowers and Lawns

The approach to the Station is steadily improving from year to year as the scheme of planting is more fully developed. The general effect at present is very beautiful, with the Station buildings as the center of a landscape and the several groves, shrubs and flowers as the setting round about. The severe winter of 1919 killed quite a number of shrubs that were considered hardy here before. This was probably caused by the very low temperatures of December before the snow came.

The flowers are one of the greatest attractions for visitors to the Station. These were very fine throughout the entire season. The pond lilies, sweet peas, dahlias and the beds of perennial flowers merit special mention.

Vegetables

Cultural and variety tests were conducted with all the leading varieties of vegetables in the field and garden. Over seventy-five sorts of potatoes were grown and a record kept including the percentage of leaf roll and mosaic diseases present. Among the few varieties that were free from these diseases was the McIntyre. An attempt is being made to locate disease resistant potatoes in order to overcome these diseases which are at present taking such a heavy toll from the potato crop. The outstanding vegetables for the season were: Celery, tomatoes, beans and peas. The celery deserves special mention. It was grown in trenches and produced a full crop which wintered well, some stalks being available for seed purposes in 1920.

BUILDINGS

An office building 30 by 30 feet was constructed just west of the Superintendent's residence. This is a frame building, with a concrete basement, including a vault for the storage of records. The first floor has a main office 20 by 14 feet, the Superintendent's office, 14 by 14 feet, and a hallway with closets. The second floor is used as a general workroom, for the selection of grain, and for the preparation of exhibition material, etc.

Seven contest houses were constructed for the egg-laying contest.

SESSIONAL PAPER No. 16

UNDERDRAINAGE.

The underdrainage systems have worked very satisfactorily, with only a few broken tile which require to be replaced.

PICNICS, DEMONSTRATIONS AND AGRICULTURAL MEETINGS

A number of farmers' picnics were held at the Station during the summer. The number coming by automobiles for this purpose has greatly increased. The Prince of Wales students also held their annual picnic at the Station and later attended several demonstrations there.

The Superintendent gave a series of lectures at the short courses throughout the province and at the classes in home economics held at Charlottetown from time to time. A course of lectures on horticultural subjects was also given to the dependents of the returned men, under the auspices of the Soldiers' Settlement Board.

Addresses were also delivered before the Central Farmers' Institute at Charlottetown, and the Nova Scotia Farmers' Association of Kentville.

The Superintendent also attended the several live-stock conventions in the province, the Maritime Provinces and the Dominion live-stock conventions in Toronto. He attended the Toronto International Exhibition and the Maritime Fat Stock Show.

EXHIBITIONS

Exhibits were prepared and shown at the provincial exhibition at Charlottetown late in September, and at the county exhibitions at Souris, Georgetown and Summerside the last week of September and the first week in October. A very fine display of descriptive panels and models was shown together with the natural and preserved specimens of the products of the Charlottetown Station. The attendance was good, the weather favourable and the Farm booth was one of the big features of all the exhibitions held in the province.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR

THE SEASON

April opened up with no snow on the ground and the frost pretty well all out. There were heavy rains during March but this had been fairly well dissipated by the first of April. Rain fell on eighteen days during the month; this, with three light snowfalls which melted as they fell, resulted in the ground being about as wet at the end of the month as at the beginning. However, light lands which drained readily were in good condition for ploughing after the middle of April and the first work on land was done at this Station on April 24. The temperature was about normal. Clovers and grasses came through the winter in excellent condition.

There was almost uninterrupted fine weather during May to the last week and the precipitation up to that time being light, farming operations were pushed along without a stop. As a result, much more work on land was possible during the month than in any other previous year.

11 GEORGE V, A. 1921

The crops seeded and grasses and clover came on rapidly showing every indication of conditions being ideal for their growth. The temperature was about 2 degrees above normal, which greatly aided in crop development. A rain of 1.13 inches on the 25th and 26th, which fell gradually, was all taken up by the soil. The sunshine was a little above normal which also helped materially in crop growth. There was frost on the 10th and again on the 15th, 16th and 17th, which was the last of the season. All seeding and the planting of practically all crops had been completed by the first of June at this Station. Never before has it been possible to complete this work so early in the season.

June was also a favourable month. There was no rainfall, except two light showers, until the 20th. This made it possible to do very much more work on damp land than is usual. Toward the end of the month the land was pretty dry, but seasonable showers at that time helped out crops and they continued to make strong growth. Fruit trees were in full bloom on June 4 and the weather being dry with a high temperature during the blossoming period favoured a good set of fruit. The amount of bloom was unusually large and indications pointed to a large fruit crop. A period of dull weather with considerable humidity favoured apple scab development from the 10th to the end of the month and trees not sprayed early developed considerable spotted fruit. The sunshine during the month was above the average. The rainfall was not as great as usual for June, but all the water which fell was absorbed by the ground, which is usually not the case. Heavy rains of short duration are generally lost by surface drainage.

During the first of July crops on naturally dry lands suffered for want of moisture, but after the 6th seasonable showers supplied crops to their requirements. The month was generally favourable throughout for all crops. Clover which was cut early was gathered in fine condition and was a splendid crop of good quality, but because of wet weather during the latter part of the month haying operations were very much hampered.

The early part of August was favourable for haying and hay generally was gathered in good condition, but in some cases because of shortage in help this operation was drawn out well into the grain harvest. The first cutting of grain started on the 16th. Dull and unfavourable weather followed until the 13th of September; this was a great drawback as early seeded grain from large areas had to be handled several times to get it into a condition for threshing or storing. Fortunately the rains in the aggregate were not great and little damage to crops resulted in this section, although in some places the grain was injured considerably.

The first half of September was wet, after which it came in dry and farmers had an opportunity to gather all late grain crops without loss. The first frost of the fall was on the 16th when 1 degree was recorded. Traces of this frost were noticeable only in places at this Station, but in some sections tender crops were badly damaged. The corn crop was exceptionally good and was gathered during the last week in September in excellent condition.

The month of October was cold, the temperature being about 3 degrees lower than the average. There were 7, 8, 7, 5, 2, 12, 6, 3, 9 and 6 degrees of frost on the 2nd, 9th, 13th, 14th, 18th, 20th, 24th, 29th, 30th and 31st, respectively. The worst frost was on the 20th and this did much injury to unpicked apples in many places. The fruit, generally, because of the frost, seemed to mature prematurely, making it necessary to use greater care in handling it than is usually the case. Because of the very large crop, shortage of efficient picking help, scarcity of barrels and the presence of the cold weather the harvesting was delayed later than usual, but in spite of this handicap all the crop was secured in fairly good shape by the last of the month and very little loss resulted. To add to the troubles of apple gathering rain fell on 15 days during the month, hindering fruit harvest very much. These rains were not excessive, however, and ploughing could be followed up as time permitted.

SESSIONAL PAPER No. 16

The rainfall during November was normal, the heaviest being 2.61 inches on the 6th, which held up ploughing for a period except on sandy areas. There were light snowfalls on the 15th, 20th and 27th, which melted soon after falling. There was no very cold weather during the entire month and ploughing was not interrupted because of frost to the end of the month. After the 30th no work was done on the land.

December has been cold, the mean temperature being 5 degrees lower than the average. The snowfall has been light but with the temperature low and the rain forming ice as it fell, sleighing was possible at certain periods. Toward the end of the month the roads became good for sleighing and continued good throughout the winter. The temperature went below zero on 8 days, the lowest being 11 degrees below on the 18th.

January was cold, the mean temperature being 10.105 degrees, while 21.28 was the average for this period during the five previous years. The thermometer went below zero on 14 nights, the lowest being 19 degrees below on the 26th. There is no record of a more severe January and frost penetrated cellars formerly considered frost-proof. There was no rain during the month and the precipitation reported was from melted snow. The snow aggregated 27 inches and only for this snow the frost would have penetrated much more deeply into the soil and even as it is, water pipes considered well below the frost line have been frozen. There have been no drifting snowstorms and roads in this section have not at any time been blocked. There was much more snow from Middleton to Yarmouth than in this section.

On the 1st of February the thermometer registered 24 degrees below zero; this is the lowest temperature recorded at this Station. After this there was no more zero weather, the remainder of the month being moderate and pleasant throughout with the mean temperature about normal. There were light snowfalls and the roads were fine for sleighing during the entire month. There were frequent heavy gales, and one in particular on the 19th did damage to buildings.

March on the whole was a fine month without the usual heavy snowstorms. Sleighing broke up on the 12th and 13th, when warm weather and a heavy rain of 1.85 inches caused severe floods which did much damage to bridges and roads. The temperature was higher than normal, although zero weather was recorded during the first week in March.

The meteorological records for the six months from April 1, 1919, as compared with the average for 1918, and the previous six years, are given in the following table:—

MEAN TEMPERATURE

Month	Average 1913 to 1918 inclusive	1918	1919
	°	°	°
April.....	39.17	38.74	40.43
May.....	48.29	53.97	50.17
June.....	57.66	57.58	59.58
July.....	64.95	65.43	65.03
August.....	64.08	61.80	63.19
September.....	56.76	58.56	58.

RAINFALL

Month	Average 1913 to 1918 inclusive	1918	1919
	Inches	Inches	Inches
April.....	2.61	0.89	3.28
May.....	2.17	1.21	2.48
June.....	2.796	2.30	2.25
July.....	2.998	4.99	2.77
August.....	2.64	1.72	2.21
September.....	3.43	8.06	3.13
Total.....	16.644	19.17	16.12

SUNSHINE

Month	Average 1913 to 1918 inclusive	1918	1919
	Hours	Hours	Hours
April.....	148.6	203.7	118.
May.....	173.6	224.6	200.4
June.....	208.7	214.9	244.85
July.....	217.6	197.8	221.98
August.....	212.5	234.2	191.77
September.....	179.9	165.8	158.45
Total.....	1,138.9	1,241.0	1,135.45

METEOROLOGICAL RECORDS, 1919 1920

Months	Temperature			Precipitation			Hours bright sunshine
	Maximum	Minimum	Mean	Rainfall	Snowfall	Total	
	Degrees	Degrees	Degrees	Inches	Inches	Inches in rainfall	
1919							
April.....	61	22	40.43	3.28	Melted	3.28	118
May.....	75	27	50.17	2.48	Melted	2.48	200.4
June.....	87	34	59.58	2.25		2.25	244.85
July.....	86	37	65.03	2.77		2.77	221.98
August.....	80	41	63.19	2.21	.....	2.21	191.77
September.....	82	31	58.	3.13	.....	3.13	158.45
October.....	66	20	45.2	3.93		3.93	124.50
November.....	60	15	37.4	7.27	Melted	7.27	57.25
December.....	50	-11	20.8	2.66	9.00	3.56	83.8
1920							
January.....	38	-19	10.115	.21	27.00	2.91	59.85
February.....	52	-24	21.80	2.73	21.00	4.83	68.71
March.....	67	-10	31.09	2.42	6.25	3.04	123.45
Total.....				35.34	63.25	41.66	1,653.01

LIVE STOCK

Shorthorn Cattle.—The registered Shorthorn stock on hand at the close of this year numbers 50 head, which consists of 1 herd bull, 22 cows, 8 heifers one year and over, 13 heifers under one year, and 6 bulls under one year. One cow Louisa May 2nd

SESSIONAL PAPER No. 16

and the old herd bull Jilt's Denis were disposed of for breeding purposes. Six young bulls were also sold during the year for breeding. Seven of the cows have qualified in the Record of Performance test, giving credible returns from twice a day milking with ordinary dairy care and regular yearly breeding. The R.O.P. production was as follows:—

Hedgyn Susan.. .. .	7 yrs. old	7,534 lb. Milk	304 lb. Fat
Hillview Victoria.. .. .	12 " "	6,596 " "	275 " "
Meadow Flower 24th	11 " "	6,786 " "	257 " "
Meadow Blossom.. .. .	10 " "	6,283 " "	259 " "
Meadow Princess	11 " "	6,074 " "	271 " "
Kentville Jessamine	5 " "	5,930 " "	238 " "
Kentville Fairy.. .. .	2 " "	4,601 " "	217 " "

This is an average of 6,257.7 pounds milk and 260.1 pounds of fat. Ten cows are running in this test at the present time. Sixteen cows have finished lactation periods during the year; 8 mature cows, 6 four-year-old, 1 three-year-old and 1 two-year-old.

The cows are handled in every way as a dairy herd. Feed rations are made up as economically as possible and fed for milk production. Meal is given at the rate of 1 pound to 3 or 4 pounds of milk produced. Roots and ensilage from 40 to 60 pounds and hay from 8 to 12 pounds per day, in two feeds.

The grain mixture during the year was made up of:—

400 pounds bran at \$2.56 per cwt.. .. .	\$10 24
300 pounds cotton seed at \$4.50 per cwt.. .. .	13 50
200 pounds ground oats at \$2.56 per cwt.. .. .	5 12
100 pounds oil meal at \$4.58 per cwt.. .. .	4 58
<hr/> 1,000 pounds costing.. .. .	<hr/> \$33 44

Average cost per 100 pounds about \$3.35.

Hay was charged at \$18 per ton and roots and ensilage at \$5 per ton. Salt is given in the meal ration, 1 pound of salt to 100 pounds of meal.

Pasture is very limited, making it necessary to feed succulent feeds in the barn during the summer months. The cows were grazed on the dyke during September which helped the fall feeding problem materially.

The herd of 16 completing their lactation period during the year averaged 271.3 days in milk, and produced 4,747.69 pounds of milk each, averaging 17.49 pounds of milk per day. The per cent of fat in milk averaged 4.09. The butter per cow averaged 228.9 pounds. The value of the butter was \$123.74 and the skim-milk \$14.63 per cow. The cost of feed per cow from calving to calving was \$107.28, leaving a profit per cow of \$31.09.

Heifer, Kentville May 2nd cost to one year of age \$85.18, made up as follows:—

Whole milk, 584 lb. at \$2.50 per cwt.. .. .	\$14 60
Skim-milk, 1,303 lb. at 50c. per cwt.. .. .	6 51
Meal, 1,367 lb. at \$3.23 per cwt.. .. .	44 15
Roots, 4,768 lb. at \$5 per ton.. .. .	11 91
Hay, 891 lb. at \$18 per ton.. .. .	8 01
	<hr/> \$85 18

Kentville Symmetry cost to one year of age as follows,—

Whole milk, 430 lb. at \$2.50 per cwt.. .. .	\$10 75
Skim-milk, 1,452 lb. at 50c. per cwt.. .. .	7 26
Meal, 1,292 lb. at \$3.23 per cwt.. .. .	41 73
Roots, 3,734 lb. at \$5 per ton.. .. .	9 34
Hay, 712 lb. at \$10 per ton.. .. .	6 40
	<hr/> \$75 48

11 GEORGE V, A. 1921

Kentville Susan cost from one to two years of age as follows:—

Meal, 1,198 lb. at \$3.23 per cwt..	\$38 69
Hay, 1,421 lb. at \$18 per ton..	12 78
Roots, 7,105 lb. at \$5 per ton..	17 76
Pasturage, June 1 to Nov. 1, 5 months at \$1.50..	7 50
	<hr/>
	\$76 73

We aim to breed the heifers at 20 months of age.

Steer Feeding.—Twenty steers were purchased October 25, 1919, dehorned, and divided into lots of ten each and placed on feed. For the first thirty days they were fed hay, waste potatoes, turnip tops, and a small allowance of grain consisting of mostly wheat bran. From November 25 to February 28 the meal mixture was made up of 300 pounds bran, 300 pounds cotton-seed, 200 pounds oats and 200 pounds screenings, and for the remainder of the period a mixture of 300 pounds bran, 300 pounds cotton-seed, 200 pounds oats, and 100 pounds oil meal. The average cost of meal per hundredweight throughout the period was \$3.15.

Turnips were fed from November 25 until the supply was exhausted, and then ensilage was given for the remainder of the period. Average amount of roots and ensilage fed each steer per day was 35.83 pounds. The steers received 10 pounds of hay each per day and averaged 6.1 pounds meal per day throughout the period.

They were watered in the yard except for a short time, when water was before them all the time.

Number of steers fed..	20
Number of days in period..	150
Total weight of steers at start..	18,140 pounds
Average weight of steers at start..	907 "
Total weight of steers at finish..	22,572 "
Average weight of steers at finish..	1,128.6 "
Total gain in weight..	4,432 "
Average gain in weight per steer..	221.6 "
Total cost of steers at start at 9½ cents..	\$1,768 00
Total selling price of steers at 12½c..	2,821 50
Total gain in value..	1,053 50
Average cost per steer..	88 40
Average value per steer at sale	141 07
Average gain in value per steer..	52 67
Total amount of meal eaten, 18,320 lb. at \$3.15	
per cwt..	\$ 578 57
Total amount of hay eaten, 30,000 lb. at \$18	
per ton..	270 00
Total amount of ensilage eaten, 46,000 lb. at \$5 per	
ton	115 00
Total amount of roots eaten, 40,000 lb. at \$5 per	
ton..	100 00
Total cost of feed for period..	<hr/> 1,063 57
Loss on 20 steers..	10 07
Average loss per steer..	50.35 cents

Horses.—One driving horse was purchased during the summer, making a total of 13 horses. During the winter one of the older and undesirable teams was disposed of, making a total of 11 horses now on hand.

Swine.—The five Yorkshire sows bred in December and January farrowed 45 pigs in April and May. Five of these were lost at farrowing time, 32 were sold for breeding, and 8 were disposed of for feeding. These sows were bred again during the summer, but intestinal troubles developed, apparently from the wheat screenings used, resulting in one sow losing her litter and another failing to develop any milk at farrowing time. The other two produced weak and inferior litters, of which several were lost from intestinal parasites. These parasites had found lodgment in the lungs, resulting in an unthrifty development and in some cases loss from pneumonia. The lungs from several of these young pigs were forwarded to the Health of Animals

SESSIONAL PAPER No. 16

Branch, Ottawa, to locate the trouble. Two of the old sows were disposed of and two produced litters of 10 and 12 during March. The pigs on hand on March 31, 1920, were 1 boar, 2 sows, and 22 small pigs.

POULTRY

Except the construction of three 6 by 8 colony houses for housing growing chickens, no additions have been made to the poultry housing equipment.

A Buckeye incubator, with a capacity of 2,440 eggs, was installed during the early spring of 1919. This incubator is fitted with fans for distributing the warm air through the egg chamber. These fans are run by electricity, and because of having only night electric service difficulty was experienced in arranging motor power for the fans. This was supplied by a water motor, but the results were not very satisfactory. Out of 1,936 eggs set, of which 91 per cent were fertile, only 27 per cent hatched. This was due to uneven water pressure and consequent variation, together with some vibration from the water motor. The hatch from 359 eggs put under hens was 80 per cent.

It was decided wise to confine the stock to Barred Plymouth Rock and White Wyandotte. After a careful selection on November 1, breeding pens were made up of 90 pullets and 28 hens of Barred Plymouth Rock and 68 pullets and 24 hens of White Wyandotte. In addition there were 40 late hatched pullets and 3 hens, making a total of 198 pullets and 55 hens. During the winter some of the pullets were disposed of, so that on March 31 there were 42 breeding hens, 121 breeding pullets, and 31 pullets undesirable for breeding.

The total egg yield from 183 pullets was 9,024 eggs for the five months commencing November 1, an average of 49.3 eggs per pullet for the whole flock.

In January, 45 pullets laid over 20 eggs each. In February, 75 pullets laid over 20 eggs each, and in March, 87 pullets laid over 20 eggs each. Pen 1 averaged 19.8 eggs in February and 25.3 eggs in March. Pen 2 averaged 19.5 eggs in February and 24.7 in March. Pen 3 averaged 18.3 eggs per pullet in February and 24.2 in March. The best pullet had 134 eggs to her credit on the 31st March and six had laid over 100 eggs.

As stated above, the whole pullet flock has averaged 49.3 eggs each for the five-month period from November 1. These at 60 cents a dozen represent a value from each pullet of \$2.465.

Feeding.—The whole grain fed during the winter was cracked corn, wheat and oats. The dry mash was made up of bran, shorts and crushed oats in equal parts. Oyster shell, grit and beef scrap were before the hens all the time, and whole mangels were supplied daily for green feed in quantity that would be eaten up nicely in two hours.

The feed cost per month has been 33.4 cents per pullet. The average pullet production during the five months commencing November 1 was 49.5 eggs per month, which were sold for \$2.46, and the cost of feed was \$1.67 for the same period, or a profit above cost of feed of 79 cents per pullet.

BEES

It has been possible to make considerable progress with bees during the season. Of the twelve colonies wintered, eleven came out in the spring fairly strong. In addition, ten colonies were purchased, and these, with the increase, gave a total of thirty-six colonies. All were wintered in cases outside, as is the usual practice.

One colony produced 316 pounds of honey. Twenty-one colonies yielded 701 pounds of apple blossom honey. In one colony 83 pounds were gathered in five days,

or an average of 16.3 pounds per day during the height of the fruit bloom. This same colony brought in 19 pounds of honey in one day as the greatest daily production. The average of the twenty-one colonies was 122.8 pounds for the season.

FIELD HUSBANDRY

Hay.—The field crops were exceptionally good during the year. The clover hay produced on the Station amounted to 61 tons 1,610 pounds; of this, 25 tons 550 pounds were gathered from 8 acres. The dyked areas yielded 58 tons 340 pounds. The total hay crop amounted to 135 tons.

Grain.—The grain yield amounted to 1,352 bushels.

Twelve acres of Banner oats yielded 62½ bushels per acre and 4½ acres of Victoria oats yielded 60 bushels per acre. Ten acres of Banner oats grown at Coldbrook yielded 57½ bushels. This makes a total of 1,926 bushels threshed.

Corn.—Eight acres of Longfellow corn produced 18 tons 1,620 pounds per acre. Other areas not in good fertility for corn produced much smaller yields. The total corn harvested for ensilage amounted to 255 tons 1,590 pounds.

Mangels.—An area in mangels averaged 939 bushels per acre, and the plot mangels averaged 980 bushels per acre. The total yield was 3,213 bushels.

Turnips.—Because of club-root it is impossible to grow a good turnip crop. The yield on one area was only 460 bushels per acre because of this disease. A small area fairly free from the disease yielded 780 bushels per acre, and a field apparently free yielded 820 bushels per acre. A total of 3,640 bushels was harvested.

CEREALS

The cereal crops were grown in one-half acre areas. The crop yields were as follows:—

Victory oats.. . . .	82.58 bushels
Banner No. 49 oats	71.29 "
Manchurian barley.. . . .	33.12 "
No. 80 C barely.. . . .	39.04 "
Duckbill barley.. . . .	26.06 "
Marquis wheat.. . . .	24.83 "
Huron wheat.. . . .	24.16 "
Red Fife wheat.. . . .	26.68 "
Spring rye.. . . .	27.50 "
Liberty hulless oats.. . . .	33.93 "
Arthur pea.. . . .	27.24 "
Golden Vine pea.. . . .	23.38 "

FORAGE CROPS

Tests were made of root seeds from different sources on uniform land of fair fertility. The plots were one-thirty-sixth acre each. The mangels produced an even stand. The carrots were also good, but the turnips were almost entirely lost because of club-root, and no reliable records as to yields were possible.

There were 60 plots of mangels, which ranged in yield from 435 to 1,218 bushels per acre. Four varieties of sugar beets ranged from 475 to 622 bushels per acre. Thirty-two plots of carrots ranged from 234 to 712 bushels per acre. Sixty-five plots of turnips were grown, but, as already stated, a record of yields was not possible.

Turnips for Seed.—Turnips were planted for seed production as follows:—

10 acres Ditmars Swede seed produced.. . . .	4,272 pounds.
8 acres Corning Green Top seed produced.. . . .	2,600 "
1 acre Corning Green Top seed produced.. . . .	504 "
10 acres Canadian Gem seed produced.. . . .	1,130 "
Total	8,506 "

SESSIONAL PAPER No. 16

The Canadian Gem turnips were attacked so badly by root maggot in the steckling stage that there were few turnips not showing injury from this insect. This injury resulted in rot developing in storage, and particularly after planting, and the stand was not one-quarter of what it should have been, thus accounting for the poor yield.

Clover for Seed.—The second-growth clover on 14 acres which had been cut for hay on July 5 to 8 was harvested during the first week in October. The weather was unfavourable for curing this crop, but it was eventually stored and threshed during the winter with the Provincial clover huller, yielding 1,838 pounds of seed as taken from the huller.

FERTILIZER AND LIMESTONE EXPERIMENTS

The orchard fertilizer experiments started in 1913 have been continued from year to year. The object is to gather information relative to the best fertilization for orchard development, and until these trees come into fruiting no definite data will be available. A record has been kept of the intercrop, and information as to the value of the intermediate crops is being secured.

The four-acre area devoted to fertilizers, applied at different rates per acre and of different combinations, has been continued under test, and at the end of another season, when the rotation is complete, some data of value should be secured.

The test with the raw ground limestone has been continued and the data given below have been secured.

Limestone Experiment.—The land on which this test was conducted was naturally a poor sandy area, and at the termination of the first rotation in 1917 it was decided to apply 15 tons of manure to the acre to the whole area. The fertilizer applied in 1914 and 1917 was very small, amounting to 140 pounds nitrate of soda, 200 pounds acid phosphate, and 101 pounds muriate of potash. Limestone at the rate of 2 tons per acre was applied in the spring of 1914 and 1917 and worked into the soil. It will be seen from the above that in the six years the limestone applied amounted to 4 tons, the fertilizer 1,082 pounds, and the manure 15 tons. The yield per acre was as follows:—

FERTILIZED IN 1914

Year	Crop	Limed, 1914		Not limed		Increase from lime	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1914.....	Potatoes.....	86	45	76	13	10	32
1915.....	Oats.....	38	14	31	24	6	24
1916.....	Hay....		1,494		666		828

MANURED AND FERTILIZED IN 1917

Year	Crop	Limed 1914 and 1917		Not limed		Increase from lime	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1917.....	Potatoes.....	329	18	302	25	26	53
1918.....	Wheat.....	30	14	23	48	6	26
1919.....	Hay.....		4,926		3,126		1,800

11 GEORGE V, A. 1921

NOT FERTILIZED

Year	Crop	Limed 1914		Not limed		Increase from lime	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1914.	Potatoes . . .	67	35	55	55	11	40
1915.	Oats...	32	27	30	15	2	12
1916.	Hay...		1,120		720		400

MANURED AND NOT FERTILIZED. 1917

Year	Crop	Limed 1914 and 1917		Not limed		Increase from lime	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1917.....	Potatoes . . .	313	25	251	50	61	35
1918.	Wheat...	29	50	19	30	10	20
1919.....	Hay....		4,090		2,640		1,450

HORTICULTURE

Orchards.—The orchard area has made excellent growth during the year and many of the young trees have fruited. The area planted in 1912 with trees 20 by 20 feet apart, or 108 trees per acre, has yielded barrels per acre as follows:—

Ben Davis.. . . .	111.24	Gano.. . . .	108.
Ribston.. . . .	50.06	Stark.. . . .	46.
Wagener.. . . .	68.04	Wealthy.. . . .	83.16
Hubbardston.. . . .	58.64	Blenheim.. . . .	2.80
Rome Beauty.. . . .	27.32	Cox's Orange.. . . .	49.24
Duchess.. . . .	64.80	Yellow Transparent.. . . .	64.04
Crimson Beauty	20.08	Ontario.. . . .	62.64

In addition to the 47 acres of orchard at this Station 18 acres were secured in the purchase of the Mrs. John Tully property, making a total of 65 acres of orchard

The cherries were a very light crop and there was considerable loss of foliage during the summer from the cherry leaf spot. The peaches have fruited a few specimens but indications are that very few varieties will be of value.

The plum crop was very light, a few bushels only being secured.

Orchard spraying experiments were continued at Berwick, Falmouth and Bridgetown and data of value secured.

Experimental work was continued with potatoes as usual and with various other vegetable crops.

The shrubs and trees on the lawns have made good growth, and these, together with the annual and perennial flowering plants, combine to make attractive farm surroundings.

BUILDINGS

Four brooder houses, 10 by 10 feet in size, were constructed for the rearing of young chicks, and these were equipped with Buckeye brooder stoves.

An enlarged apiary house 14 by 18 feet was also constructed.

ADDITIONAL FARM PURCHASED

In order to assist in the training of returned men, a property adjoining the Experimental Station was purchased from Mrs. John Tully. This included 101.5 acres in upland east of Canaan Road, 17 acres in woods west of Canaan Road and

SESSIONAL PAPER No. 16

11.4 acres of dyked land, making a total of 129.9 acres. This area was used by men in training during the season and they were given practical work in ploughing and preparing ground for grains and other crops and the management and harvesting of the same.

EXHIBITIONS

An exhibit of farm produce and live poultry was made at the following points: Halifax, N.S., on the 3rd to 5th of November; New Glasgow, N.S., 10th to 12th November; Truro, N.S., 25th to 27th November; Amherst, N.S., 15th to 19th December; and Kentville, N.S., December 29, 30, and 31.

AGRICULTURAL MEETINGS

Agricultural meetings were attended at different places during the year and addresses delivered on agricultural topics.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

THE SEASON

The freeze-up for the winter came on November 17, 1918. The winter was characterized by a lack of severe weather, heavy storms and snowfalls. Only three days of zero weather were recorded throughout the months of January, February and March, these all occurred during the first-named month. The snowfall for the year aggregated 32.75 inches, as compared with 79 inches for the year 1918 and the average of 75.6 inches for the previous five years.

Backward weather during April, with fourteen days of rainfall, resulted in the frost coming out of the ground slowly. Only during the latter week did the fields and highways show signs of drying up.

Bright, fine weather, with a normal mean average temperature and occasional beneficial showers, prevailed throughout the greater part of May, but owing to the fact that but little fall ploughing had been done the previous autumn, seeding operations were hindered materially. Seeding operations were commenced at the Farm on May 17 and continued until June 28, when the last fields were sown to buckwheat.

June was an ideal spring month, characterized by a normal mean temperature, precipitation and an exceedingly high total hours of sunshine. The precipitation of 2.73 inches fell on eight days and was evenly distributed, which made conditions ideal for all classes of farm crops, especially hay and grain.

July was a favourable month for growing crops but unfavourable for haymaking. Temperature and sunshine were normal, and precipitation heavy.

The month of August was very unfavourable for rapid haymaking and early harvesting. Rainfall occurred on thirteen days, which, although not heavy at any time, was sufficient to seriously hamper farm work.

September was a normal month in respect to temperature but lacked in total hours of sunshine. Precipitation was higher than the average for the month.

October was, for the most part, an average one. The mean average daily temperature was 43.11 degrees as compared with 46.86 degrees for the previous year. Rain fell on ten days aggregating 2.50 inches but it was fairly evenly distributed and work in connection with the harvesting of all crops progressed favourably. The month closed with all grain crops harvested.

11 GEORGE V, A. 1921

The first week in November was characterized by very heavy gales and a precipitation of 5.69 inches, made up of 5.09 inches of rain and 6 inches of snow. In spite of this, the root crops were successfully harvested and approximately one hundred acres of land were ploughed in preparation of the season of 1920.

December was an abnormal month. It was characterized by unusually severe weather, the coldest, with the exception of 1917, during the previous seven years. Cold settled weather prevailed throughout, with nine days of zero weather, the coldest of which occurred on the 18th when the mercury dropped to 18 degrees below zero. The precipitation aggregated 2.05 inches, made up of 1.2 inches of rain and 8½ inches of snow. At no time during the month was there snowfall sufficient for sleighing.

METEOROLOGICAL RECORDS

Month	Temperature			Precipitation			Sunshine	
	Highest	Lowest	Mean	Rainfall	Snowfall	Total	Days	Hours
				Inches	Inches	Inches		
January	52	-13	20.99	1.24	3.25	1.56	19	86.7
February	39	2	23.72	0.48	15.00	1.98	17	101.7
March	53	0	29.75	2.24		2.25	19	120.9
April	60	20	38.65	3.26		3.26	17	94.3
May	75	24	48.40	2.27		2.27	29	197.8
June	84	31	58.38	2.73		2.73	28	238.2
July	85	33	64.83	3.88		3.88	28	206.7
August	80	38	63.17	1.28		1.28	28	200.0
September	78	33	56.80	3.97		3.97	22	134.0
October	64	20	43.11	2.50		2.50	22	127.0
November	60	7	35.98	5.09	6.00	5.69	15	58.8
December	48	-18	17.44	1.20	8.50	2.05	20	98.3
Total				30.14	32.75	33.42		1,664.4

LIVE STOCK

Horses.—Eighteen horses are kept at the Station, including four pure-bred Clyde mares, two two-year-old mares, one two-year-old stallion, one one-year filly, one span of grade Clyde mares and one grade yearling colt. The remaining horses are just ordinary grades. The above horses are used to carry on the work at the Station, as well as for breeding and experimental feeding work, and are in good condition for this year's work.

Dairy Cattle.—The "grade-up" experiment, being conducted with dairy cows of average breeding, has now completed its seventh year's work. The object of this experiment is to prove that by the use of a pure-bred sire of the highest type which is backed by high milking qualities one can increase his profits many times, and that, after all, it pays to use nothing but the best if the most paying results are looked for. Up to date this has been proven as the majority of the individuals produced are superior to their dams, not only in production, but likewise in type and dairy conformation.

Beef Cattle.—Twenty-three steers of average beef type were fed during the winter. These steers were divided into four lots. Lot 1 consisted of eight steers which were tied. Their average weight at the beginning was 1,062 pounds and at the finish, their weight was 1,236.7 pounds. These were fed the following meal mixture: 200 pounds bran, 200 pounds oats, 100 pounds cotton seed, 50 pounds oil cake. Lot 2 consisted of five steers loose in box stall. Their average weight at the beginning was 1,061 pounds, and at the finish, their weight was 1,224 pounds. These received the same meal mixture as Lot 1.

SESSIONAL PAPER No. 16

Lot 3 consisted of five steers loose in box stall. Their average weight at the beginning was 893.4 pounds and their weight at the finish was 1,067 pounds. The meal mixture they received was as follows: 200 pounds bran, 100 pounds crushed oats, 100 pounds ground screenings. Lot 4 consisted of five steers loose in box stalls. Their weight at the beginning was 837.6 pounds and at the finish, their average weight was 1,001.6 pounds. They received the following meal ration: 100 pounds bran, 200 pounds screenings, 100 pounds cotton-seed, 50 pounds oil cake.

The costs per pound of the meal mixtures are as follows: Lots 1 and 2, 3.19 cents. Lot 3, 3.15 cents. Lot 4, 2.93 cents.

The following table is a summary of the four lots fed, giving the main points of interest, for comparison:—

		How Housed			
		Tied in barn		Loose in stall	
		Lot 1	Lot 2	Lot 3	Lot 4
		Roots and meal	Roots and meal	Roots and meal	Roots and meal
Number of steers.....		8	5	5	5
Average weight of steers at start....	lb.	1,062	1,061	893.4	837.6
Daily rate of grain per steer.....	lb.	2.081	1.947	2.066	1.952
Cost of 1 pound gain.....	cts.	22.35	23.89	21.16	22.42
Cost of feed per steer per day...	cts.	46.54	46.54	46.11	43.78
Profit per steer.....	\$	20.60	19.08	14.96	13.69

The most striking point in the above test is that there is a greater profit to be realized in the feeding of steers over 1,000 pounds, because you have increased in value, in the heavier steer, a larger amount of meat, which costs you some two or three dollars less than that for which it is sold.

The spread in this case was \$3.48, which is a fairly good spread between the buying and selling price. The profit per steer should be encouraging to the beef feeders inasmuch as fair profit may be realized out of beef even at the high prevailing price of mill feeds.

Sheep.—Two flocks of sheep are kept at the Farm. One is a grade flock, consisting of thirty-one breeding ewes of all ages. We are carrying on improvement work in breeding up more profitable ewes by the use of good pure-bred rams. Some excellent results have been obtained up to date. The pure-bred Shropshire flock consists of thirty-two breeding ewes of all ages, which are in good condition and giving most satisfactory results. The object of this flock is to aid in the improvement of the Shropshire breed by selling out good stock rams, to show the cost of production and profit to be realized out of a good pure-bred flock and to obtain information on the cost of maintenance.

Swine.—Two herds are kept, viz.: Yorkshire and Berkshire. Unfortunately, we have not had very good results from our pigs as many of the young stock have died with white scours. At the present time we have eight pure-bred Yorkshires, one Yorkshire boar, one Berkshire sow, one Berkshire boar and thirty young feeders.

POULTRY

The past year has been a very successful one at this Farm in the poultry work.

Three breeds were kept, namely, Barred Rocks, S. C. White Leghorns, and White Wyandottes. The number of each breed wintered during 1919-20 was as follows: S. C. White Leghorns—3 males, 40 hens and 56 pullets; Barred Rocks—4 males, 68 pullets; White Wyandottes—17 pullets.

11 GEORGE V, A. 1921

Weather conditions in the Maritime Provinces are such that the successful hatching of early chicks is a very difficult task. The aggregate number of eggs set during April and May, 1919, was 2,758. 72.9 per cent proved fertile, and 39.77 per cent hatched, giving a total of 791 chicks. Owing to a severe attack of white diarrhoea, however, the mortality was very high. This condition is brought about very largely by sudden changes in temperature and the chicks getting a chill. Consequently, only 268 were brought to maturity. From the winter production of eggs more satisfactory results were obtained. The number of eggs laid and the cost per dozen is as follows: November, 86 eggs at \$1.52 per dozen; December, 202 eggs at 60 cents; January, 456 eggs at 39 cents; February, 531 eggs at 26 cents, and March, 657 eggs at 22 cents. Taking into account the very severe winter, this may be considered a very good showing for 181 birds, most of which were late-hatched pullets.

Egg-laying Contest.—Egg-laying contests in the past have been a factor not only in stimulating a greater interest in poultry work, but have aided much in increasing production from a commercial standpoint. For these reasons it was decided to start a contest at Nappan with the object of helping the poultry breeders in the sections of the provinces of Nova Scotia and New Brunswick, which this Farm serves.

The contest was opened November 1, 1919, with twenty entries of ten birds each. Out of the twenty contestants, nine were from Nova Scotia, eight from New Brunswick, two from Ontario and one from Quebec.

In spite of the cold winter, and the fact that many of the birds entered were late hatched pullets, the results up to date are most encouraging. Approximately 9,000 eggs have been produced during the five winter months from 200 birds.

BEES

From an apiarist's standpoint, the past season has been only fair. A fairly mild winter, followed by a late cold spring, caused a heavy mortality. Seven colonies which survived the winter of 1918-19 were increased to fourteen during the season.

The total production from fourteen colonies was 599 pounds of extracted honey. The highest production from a single colony was 147 pounds and the average for all colonies was 55.5 pounds. A ready market was found for the honey at 30 cents per pound.

FIELD HUSBANDRY

The past season was considered only a fair one so far as general farm crops were concerned. The spring was cold and backward, retarding growth until well on to June. However, good growing weather was experienced through June, July, and part of August, but the conditions for the curing of hay were most unfavourable. Consequently, the quality was not nearly so good, on the average, as for 1918. There was, however, an increase of one-half ton per acre over the previous season. The total amount of hay cut at this Farm during the season was 325 tons 440 pounds. The upland hay ranged from 1 ton 1,400 pounds per acre, to 2 tons 108 pounds per acre, while the marsh lands ran from 1 ton 675 pounds to 1 ton 836 pounds per acre. The latter yields are good when it is taken into account that during the last three years these marsh lands have been heavily flooded.

All grains, excepting mixed grain, were below the average yield of 1918. The following are field returns. Banner oats, 39 bushels per acre; Ligowo oats, 46 bushels per acre; Charlottetown No. 80 barley, 23 bushels per acre; French Chevalier barley, 16 bushels per acre; Red Fife wheat, 16½ bushels per acre; Huron wheat, 15 bushels per acre; Silver Hull buckwheat, 13½ to 16½ bushels per acre; mixed grain, 44 bushels per acre.

SESSIONAL PAPER No. 16

It was only a fair season for corn, the weather being too cold and wet during the early stage. The five acres produced 62 tons 1,960 pounds, or 12 tons 1,192 pounds per acre.

Roots were not a very successful crop. The season was by no means favourable for big yields. This held true throughout the district with but few exceptions. The yield at this Farm was away below the average. It was only 508½ bushels per acre on an eight-acre field, which was well tilled and had received plenty of fertilizer.

FIELD EXPERIMENT

The experiment we conducted to show the value of ground limestone, when used on our heavy clay soils, gave results that are very convincing as to the part ground limestone will play in increasing production, especially in the case of clover hay.

The average results over a period of three years showed a profit over the cost of the limestone, when used in different quantities per acre, as follows: One ton per acre, \$0.38; two tons, \$4.56; three tons, \$2.71; four tons, \$2.86; five tons, \$1.69; check plot, zero. This shows that on the average, two tons per acre is about the most profitable amount to use. The total values of three-year crops were \$60.29, \$69.03, \$73.08, \$72.21, \$81.56, and \$55.87, respectively.

CEREALS

Wheat.—Ten varieties of wheat were tested in duplicate test plots of one-sixtieth of an acre each. The highest yield was Huron (Ottawa), 2,640 pounds, or 44 bushels per acre. The lowest was No. 86 D-2, 1,719 pounds, or 28 bushels 30 pounds per acre.

Barley.—Eight varieties of barley were tested in like manner to those of wheat. The highest yield was six-rowed Stella-Ottawa 58, 1,680 pounds, or 35 bushels per acre. The lowest was Albert, 600 pounds, or 12½ bushels per acre. In the two-rowed varieties, Charlottetown No. 80 gave 2,715 pounds, or 56 bushels 27 pounds per acre. The lowest was Duckbill-Ottawa 57, 1,590 pounds, or 33 bushels 6 pounds per acre.

Oats.—Ten varieties were sown in test plots. Highest yield was Ligowo, 3,090 pounds, or 90 bushels 30 pounds per acre. The lowest was Lincoln, 2,535 pounds, or 74 bushels 19 pounds per acre.

Buckwheat.—Only five varieties of buckwheat were sown and gave the following yields: Grey, 1,410 pounds per acre; Japanese, 1,455 pounds; Rye, 1,380 pounds; Silver Hull, 1,515 pounds and Tartarian, 1,185 pounds per acre.

Field crop of seed grain.—One acre of Red Fife gave 16 bushels 30 pounds per acre of fairly good grain. One acre of Huron yielded 15 tons of good seed. This grain will be used for seed purposes.

FORAGE PLANTS

Corn.—Ten varieties of fodder corn were tested in duplicate plots of one one-hundredth of an acre each. The highest yield was obtained from Longfellow, 14 tons 500 pounds per acre. The lowest was from Yellow Flint, 7 tons 250 pounds per acre.

Sugar Beets.—Four varieties only were tested. The highest yield was obtained from Chatham-grown, 10 tons 250 pounds, or 405 bushels per acre. The lowest was from Waterloo, 9 tons, or 360 bushels per acre.

Turnips.—Fifty varieties were tested in plots of one one-hundredth of an acre each and the highest yield was obtained from Perfection Purple Top, while the lowest was from Drummonds, 6 tons 400 pounds, or 248 bushels per acre.

11 GEORGE V, A. 1921

A commercial variety test was also made of some fifty leading varieties as to their purity and trueness to type. Samples of the same varieties were obtained from different wholesale seedsmen and planted in duplicate plots. The results obtained were most striking, inasmuch as it was found that a great many of the varieties, sold under different names, were practically identical; further, that very few of the present varieties were pure or true to type. For example, Elephant and Monarch are sold as two distinct varieties, yet, so far as the eye could tell, they were identically the same. Other varieties would run as low as 50 per cent true to type.

Turnip Seed Production.—Five and one-half acres were planted to Monarch stecklings on May 15. Seed was gathered and threshed on September 18, threshed on canvas September 23 and later it was cleaned. The average yield per acre was 300 pounds. The yield is below the previous season, which ranged from 500 to 1,200 pounds per acre.

HORTICULTURE

Apples.—The apple crop was above the average for most varieties. Arabka Winter was one of the heaviest producers at the Farm. Northern Spy, Charlamoff, Pewaukee, Baxter, Grimes Golden, Wealthy, Astrachan, and Duchess yielded in order of standing. The non-productive varieties were Rome Beauty, McIntosh, and Bethel. The highest percentage was No. 2.

Strawberries.—Fifty-two varieties were on test, eight of which were winter-killed. The yields were not more than average, principally due to too heavy soil. The highest yield, 5,808 quarts per acre, was obtained from Success. The lowest was from Bederwood with only 1,584 quarts per acre. The average was approximately 3,872 quarts per acre.

Raspberries.—Eight varieties of raspberries, which were on test, showed a marked falling off in yield as compared with previous season's yield. King yielded 4,840 quarts, while Hubert produced only 1,331 quarts per acre. The average yield for all varieties was 2,718.7 quarts per acre.

Gooseberries.—Seventeen varieties were planted in 1916. The majority were English varieties which have since suffered severely with Downy Mildew. Consequently, the yields were not sufficient to warrant them being recorded.

Currants.—Most satisfactory production was recorded from the black, red and white currants, with the exception of Clipper, a black variety. The highest yields from the blacks, 14,189.6 quarts per acre, was obtained from Victoria. The lowest yielder was Clipper which produced no fruit. Eclipse was next with only 765.7 quarts per acre. The average for all varieties was 5,903.6 quarts.

Of nine varieties of reds, Red Dutch gave the best returns, 18,278.9 quarts, while Pomona only yielded 4,423.9 quarts per acre. The average for all varieties was 11,908.0 quarts per acre.

Only three varieties of whites were grown. The yields per acre from these were as follows: Large White, 10,209.0 quarts; White Cherry, 6,694.6 quarts; White Grape, 7,078 quarts.

Potatoes.—Thirty-one varieties of potatoes were tested in duplicate plots of one one-hundredth of an acre each. The season, on the whole, was most unfavourable for large returns to be realized, especially during the latter part of July and August, when the weather was fairly wet. Consequently, the conditions were ideal for blight, and the yields certainly show the effect of it. The highest producer was British Queen, an English variety, 433 bushels 20 pounds per acre. The lowest was Dalmeny Beauty, 136 bushels 40 pounds per acre. The average for all varieties was 342 bushels 24 pounds per acre.

SESSIONAL PAPER No. 16

Elite Stock.—The improvement of the strains of Irish Cobbler, Wee MacGregor, Green Mountain, Empire State, Carman No. 1, and Rawling's Kidney was carried on, but the result during the past season was not very encouraging, for on inspection, it was found that a number of the varieties were infected with Leaf Roll and Mosaic.

Vegetable Seed Production.—A start was made in producing vegetable seed but only fair results were obtained. The season was unfavourable, especially at harvest time, making it almost impossible to harvest the seed properly. However, four pounds of good parsnip seed were produced. This work will be continued next season.

Shrubs.—All ornamental shrubs came through the winter in fairly good condition and made a very satisfactory display during the summer.

Annual Flowers.—Only fair results were obtained from bedded plants, most of which were stunted in the hot beds before setting into the open. Sweet peas and nasturtiums did exceptionally well.

FARM IMPROVEMENTS

The roof of the bull and calf barn was shingled and ventilators were required.

A new farm cottage was erected on the opposite side of the main road from the Superintendent's house. The size of said cottage is 26 feet by 33 feet with four rooms and bath upstairs, and a living room, dining room, kitchen and pantry downstairs. The foundation is of concrete 7 feet high and 12 inches thick. The floor of the cellar is also concrete.

An addition of 30 feet by 33 feet was built on to the old house at the creamery and the whole made into a double house. On the south side there are three bed-rooms and a bath upstairs, and a living room, hall, dining room and kitchen downstairs. On the north it is the same except that upstairs there is one more small bed-room. Both sides were wired for electric light on separate meters. When the water system is installed in these houses, they will be two very comfortable dwellings.

Ten new colony houses were built in October for the contest work and one for the main plant. These houses were 10 feet by 12 feet, each of which was divided equally by wire mesh partitions. Each pen was fitted out with roosts, dropping boards, trap nests, water bowls, grit, shell, charcoal, beef scrap and dry mash hoppers.

The necessary repairs were made to all farm buildings.

Fences.—All fences were put in as good repair as possible for the year. Approximately 2,000 feet of woven fence, style No. 950, 9-line wire, 50 inches high, uprights 22 inches apart, was erected on the north side of the Farm.

Farm Roads.—The split log drag was used on all the roads several times during the season in order to keep them in good repair and prevent the growth of weeds. Some time was also devoted to the maintenance of the public highway between the Experimental Farm and Nappan and Maccan stations.

EXCURSIONS AND VISITORS

The two largest gatherings held at the Farm during the season were the Cumberland County Farmers' Association on July 16, with a small attendance owing to unfavourable weather conditions, and the Knights of Pythias on August 20, with an attendance of approximately 2,500 people. A number of small parties and farmers' clubs visited the Farm at various times during the season. Everything possible was done to make the time interesting and of value to the visitors.

11 GEORGE V, A. 1921

MEETINGS AND EXHIBITIONS

Throughout the year the Superintendent and the Assistant attended as many agricultural meetings and exhibitions held within the province as possible, giving assistance wherever their services were requested. Following is a list of meetings addressed and exhibitions attended: Dorchester, June 12; Amherst Head, October 9; Amherst Ploughing Match, October 14; Dorchester, October 15; Amherst Head, organizing a farmers' club, October 29; Halifax Poultry Show, November 2; Truro Poultry Show, November 26; Oxford County Show, September 25 and 26; Maritime Winter Fair, December 16 to 18; East Amherst, December 26; Nova Scotia Farmers' Association Meeting at Truro, January 7 to 9; Fruit Growers' Meeting at Kentville, January 27; Dominion Live Stock Breeders' Meeting at Toronto, February 2 to 5; Experimental Farm, Ottawa, February 8.

The Farm exhibit was put up at Oxford on September 25 and 26, and at Shubenacadie on October 1 and 2.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD

THE SEASON

The autumn months of 1918 were fine and mild enabling the closing up of farm operations in well advanced condition for the spring of 1919. Ploughing was possible till November 23, and live stock remained on pasture during the day till that date. Snow came early in December and made goods roads till the middle of the month. The ground was then bare till the 25th, after which there was a nice even blanket of snow until the 20th March. There was very little winter-killing; the ground dried out early and ploughing began on April 23. Seed turnips were planted on the 28th and wheat seeded on the 30th. Grasses and clovers and fall grain came through the winter and spring with a full stand. Farm work generally was a week ahead of the average. Fall rye 30 inches high began to head out on the 1st of June. There was a frost at this date which cut down anything susceptible. June was dry with cold nights throughout, and July did not bring the usual heat. The weather was dry but this was favourable to soil conditions on the Station and all crops except corn did well. August was moist and cloudy without much precipitation, grain filled well but it was poor weather for harvesting. September brought moist cloudy days with very heavy rain on the 13th, conditions which interfered seriously with harvesting. Considerable grain sprouted in the stook and there was also caused a wide-spread infestation of Late Blight on potatoes. Slight frosts on the 16th and 28th of September did not do any damage on the Station. Frosts on the 2nd and 9th October, however, cut down garden crops and potatoes and night frosts were frequent during the rest of the month. November brought hard freezing on the 3rd. From the 13th a warm spell followed until the 19th, when winter set in, but with little snow till February. From then till the end of March was one of the roughest periods in the meteorological history of the province.

SESSIONAL PAPER No. 16

METEOROLOGICAL RECORDS

Month	Temperatures F.			Precipitation			Sunshine
	Mean	Highest	Lowest	Rainfall	Snowfall	Total	
1919	°	°	°	Inches	Inches	Inches	Hours
April.	39.7	64	18	2.01	2	2.21	126
May.	54	77	28	3.70		3.70	213.20
June.	64.2	90	52	2.24		2.24	205
July.	67	92	46	3.29		3.29	201.40
August.	64	82	39	2.07		2.07	163.35
September.	56.5	76	30	5.21		5.21	138.95
October.	43.5	62	19	2.85	.50	2.90	121.80
November.	33.5	55	2	2.31	6	2.91	81.75
December.	11.8	44	25.5	1.04	13	2.34	121.55
1920							
January.	4.1	35	-25	Nil	12.50	1.25	110.15
February.	16	38	-25	1.73	52	6.93	97.55
March.	27	63.5	-19	1.68	11	3.58	152.70
				28.13	97.00	38.63	1,733.40

LIVE STOCK

Horses.—Fourteen draught horses and two driving and general purpose horses were kept to carry on the work during the year. Of these, eleven worked throughout the year, and five worked from April till November. There were also three three-year-old colts, three two-year-olds, one yearling and two colts under one year. Of these, seven were pure-bred Clydesdale mares and fillies, nine were high-grade Clydes, five were high-grade Percheron, two were draught geldings of undetermined breeding, and two were partly standard bred, Morgan and thoroughbred. A two-year-old Clydesdale stallion was received in November from the Central Experimental Farm. Two grade Percherons, on cheap winter feeding, each cost \$13.48 for food during January, February and March. One weighed 1,430 pounds on January 1 and 1,425 pounds on April 1, while the other weighed 1,435 pounds on January 1 and 1,380 pounds on April 1.

Dairy Cattle.—Three pure-bred dairy herds are kept, viz., dairy Shorthorns, Ayrshires, and Holsteins. The largest producer for the season was an eight-year-old dairy Shorthorn. Her milk yield for 395 days was 14,682 pounds with a butter yield of 619 pounds. The best Ayrshire was a two-year-old that, in an unfinished period of 179 days gave 7,637.5 pounds of milk and 370.2 pounds of butter. The best Holstein was a five-year-old which in 376 days gave 9,800 pounds milk and 400 pounds of butter.

The grading up experiment is now fully started as three first cross herds, viz., Holsteins, dairy Shorthorns and Ayrshires are in the stable. These heifers are out of cows of no particular breeding that were cheaply picked up in the country nearby. Most of the Holstein grades are well on in the second lactation period. The dairy Shorthorns have completed their first period, while the Ayrshires have not all as yet been bred. While some of the common cows above mentioned proved very good producers, most of both the Holstein and Shorthorn grade heifers excelled their dams in their first period.

Eight of the original cows from which Holstein grade heifers were bred, gave an average milk yield for the season, of 4,596 pounds of milk and 218 pounds of butter, 359 pounds of butter. Her mother gave 5,367 pounds of milk with 257 pounds of milk and 229 pounds of butter.

11 GEORGE V, A. 1921

Eight of the original cows from which Shorthorn grade heifers were raised, gave an average season's milk yield of 5,422 pounds with 276 pounds of butter, while their eight Shorthorn grade daughters as two-year-olds averaged 5,159 pounds of milk, with 240 pounds of butter.

The best individual Holstein grade in 373 days gave 8,833 pounds of milk with 359 pounds of butter. Her mother gave 5,367 pounds of milk with 257 pounds of butter in 272 days.

The best individual Shorthorn grade in 384 days gave 7,545 pounds of milk with 336 pounds of butter. Her mother gave 6,428 pounds of milk with 265 pounds of butter in 254 days.

The records kept on the cost of rearing dairy Shorthorn grade heifers have shown that the cost of their feed to one year of age was \$36.21, to two years of age, \$82.29, and to the time of calving from \$104.79 in the case of a heifer 2 years and 7 months old, to \$152.22 for a heifer 3 years 4½ months old. The stable ration fed these heifers while carrying their first calf cost 27½ cents per day. Their weights recorded a few weeks before calving averaged 1,037 pounds.

Beef Cattle.—No steers were bought in for feeding. Three second cross Shorthorn grade steers were raised. One of them took first place at Amherst Winter Fair in his class, and championship for the best beef animal sired by a Shorthorn bull. The other two weighing respectively 895 and 850 pounds at 13½ months old, were sold at auction for beef at \$96 each. The 895-pound steer dressed 497 pounds of beef, and the 850-pound steer dressed 493 pounds of beef. The feed cost of these steers was approximately \$61 each. A pure-bred Shorthorn heifer that would not breed, was sold for beef at 3 years and 9 months old, by auction for \$191. She weighed 1,450 pounds and dressed 963 pounds. Her beef sold from 50 cents per pound down, according to the cut, for the Easter market.

Swine.—Five pure-bred Yorkshire sows and two grades have given good litters both spring and fall. The young pigs from the pure-bred sows have been sold for breeding, and those from the grade sows were sold for feeding. Sows have been running on pasture during the summer and wintered in cabins with plenty of yard room for exercise. Experience with feeding and rearing fall litters has not been satisfactory though yard exercise in fine weather has been constantly given them. Breeding sows were wintered largely on mangels.

Sheep.—The flocks of Shropshires and Cheviots have done well except that, unfortunately, the Shropshire ram proved useless, and no lamb crop was obtained from ewes of this breed. Cheviot rams were sold to New Brunswick farmers. A prize winning Shropshire ram lamb was bought from Prince Edward Island and an excellent lamb crop has started for the season of 1920. A large percentage of ewes are throwing twins and two lots of triplets have come.

POULTRY

The flock for the winter of 1918-19 consisted of 88 White Leghorns, 115 Rhode Island Reds, 24 Barred Rocks and 45 White Wyandottes, with 12 male birds.

The egg production for the year averaged 101 eggs per hen, and the average price per dozen for eating eggs was 52 cents. The average return per hen on a purely eating-egg basis was therefore approximately \$4.37, and the cost of feed averaged \$3.60, leaving a profit of 77 cents per bird, or \$217.91 for the flock. The extremes between hens ranged from a profit of \$4.98 for a bird laying 195 eggs, to a loss of \$1.94 for one laying only 48 eggs. A pen of 23 April hatched White Wyandottes cost for food \$85.27, and the eggs they laid were worth \$141.21, leaving a profit above cost of food of \$55.94, an average profit per bird of \$2.43.

SESSIONAL PAPER No. 16

A pen of fifty-six April-hatched Rhode Island Red pullets made a profit of \$74.06 above cost of feed (\$1.32 per bird) for the six months from November to April, inclusive, while a pen of May-hatched pullets (56 birds) of the same breed for the same period, made only \$13.63 profit or a little less than 25 cents per bird.

Four hundred and fifty chickens were raised and a number sold for breeding purposes. Hatching eggs from the best pens were also distributed in considerable numbers.

BEES

Ten colonies of bees were wintered, two in the honey house and eight in quadruple winter cases. One colony in winter case died. The remaining nine colonies made 698 pounds of extracted honey of a total value of \$199.64. The greatest yield from one colony was 160 pounds. The average return per colony was \$22.18. Colonies were increased to eleven. Honey was gathered principally from dandelion, fruit blossoms, raspberry, clover and goldenrod. The date of the last flight of bees in the fall was October 23 and the first flight in the spring, March 23. The time employed in the care of the apiary averaged approximately five hours per week from May until September.

FIELD HUSBANDRY

Hay, oats, turnips, silage corn, potatoes, fall rye, wheat and mangels were the principal field crops grown, in the order of acreage mentioned. Approximately forty-five and one-half acres in hay yielded 96½ tons. Twenty-one and three-quarter acres of oats yielded 65½ bushels of oats per acre. Four acres of oats on fertilizer test plots averaged 48½ bushels per acre. Fifteen and four-fifth acres of turnips yielded 733 bushels per acre. Ten acres of silage corn planted on the 3rd, 4th and 5th of June yielded at the rate 17.2 tons per acre as hauled to the silo. Eight and two-third acres of potatoes gave 297 bushels per acre. The cost of growing a single acre set apart for the purpose, including everything except rent of land and depreciation of machinery, was \$100.88. No fertilizer except 15 tons of stable manure on a clover sod was used. The cost of manure and applying it was charged at \$19.92. Seventeen bushels of seed cost \$1.50 per bushel. The value of the potatoes when shipped to Ottawa in the spring at \$7 per barrel was \$549.76, leaving a profit over all costs of \$427.48 per acre. (Had commercial fertilizer been used exclusively instead of stable manure the profit would probably have been at least \$70 less.) Four acres of fall rye yielded 32¼ bushels per acre. Three acres of White Fife spring wheat gave 27 bushels per acre and one acre of Dawsons Golden Chaff fall wheat, 33½ bushels. An acre and two-fifths of Yellow Intermediate mangels yielded at the rate of 1,205 bushels per acre. An acre of peas and oats gave 7 tons 1,275 pounds of green fodder as hauled to silo, and 27 tons 1,595 pounds of clover, grasses, etc., were gathered up around the headlands, orchards and second growth clover, and ensiled.

FERTILIZER EXPERIMENTS

The eighty-eight plots on which fertilizers at different rates and varying composition were applied in 1918 for a potato crop, were this year in oats, and an average yield of 48½ bushels per acre was obtained with variations from 57 bushels per acre to 25.2 bushels per acre. This experiment will be concluded in 1920, but should be repeated for several rotation cycles on the identical plots, as the residual results of a previous and entirely different test on the plots are quite evidently causing results which make the present experiment not very readily intelligible.

CEREALS

The tests of varieties of wheat, oats, barley and peas were continued. Seven varieties of wheat were grown. White Russian, with 25 bushels and 50 pounds per

11 GEORGE V, A. 1921

acre, gave the best yield. There was considerable glume spot on the crop which interfered with the filling of the grain. Of six varieties of oats, Banner led with 65 bushels and 10 pounds per acre, Victory came next with 62 bushels and 22 pounds, followed by Ligowo with 55 bushels and 30 pounds. Banner ripened in 91 days, Victory in 94 days, and Ligowo in 96 days. Of five varieties of barley, O.A.C. 21 was best with 36 bushels and 37 pounds ripening in 85 days. Peas were very poor though one plot of Arthur peas gave 35 bushels per acre.

FORAGE CROPS

The field forage crops have been reported on under Field Husbandry. Turnip seed grown on the Experimental Farms was tested in comparison with commercial seed as offered by the trade. Swede Purple Top seed from the Central Experimental Farm at Ottawa gave the best crop, with 1.168½ bushels per acre, and the average yield from the six samples of seed grown at the various Eastern Experimental Farms was 911 bushels per acre. The average yield from 59 samples supplied by seedsmen was 847 bushels per acre which demonstrates that Canadian grown seed is at least as vigorous as any that can be obtained by the seed trade.

Turnip stocklings grown in 1918 were stored in pits and cellar by different methods. One pit had upright ventilation every eight feet only, one had bottom ventilation connecting to uprights and one had side as well as bottom ventilation with uprights. None of the pits kept well, and were emptied in March for feeding. The pit with the most ventilation was best preserved. In the cellar the stocklings were stored in barrels, crates, deep narrow bins, wide shallow bins and shelves. In all but the deep bins stocklings kept well till the end of March but during April crown rot took a large percentage except those in the barrels and crates. Stocklings spread 15 inches deep in another large cellar kept almost perfectly. On one field of 3.34 acres there was only about a 50 per cent stand due to crown rot and the yield of seed was 878 pounds. A field of 1.59 acres planted from the cellar where the roots kept well, gave a seed yield of 1,256 pounds. Tests were made in the comparing of stocklings of different sizes, planted at different dates, at different distances and different depths, and the largest yield was from turnips above 4 inches in diameter planted 12 inches apart in rows 42 inches apart.

HORTICULTURE

Large Fruits.—The apple orchard came through the winter in good condition and several varieties bore their first fruit. Included in these were a number of promising new varieties in the variety orchard. Two sprays were applied during the season. Many trees in the plum, pear and cherry orchard are in poor condition. Two varieties of cherries, the English Morello and Orel bore a good crop. One variety of plums, Moores Arctic, bore fruit.

Small and Bush Fruits.—In the spring of 1919 a new strawberry plantation was set out to replace the one destroyed by fire. The black currants bore a good crop, and different varieties showed a wide range in yielding capacity. The highest yield was 13,794 boxes per acre from Kerry. The lowest yield was 2,178 boxes per acre. The red currants were badly attacked by Anthracnose and some varieties were quite defoliated early in the season. The highest yield was 7,865 boxes per acre from Perfection. The lowest yield was 242 boxes per acre. Gooseberries have not done well. Growth has been slow and yields poor. Raspberries have done fairly well. The highest yield was 5,445 boxes per acre from Newman's Seedling No. 23. The lowest yield was 495 boxes. The vineyard continued to make satisfactory growth and several varieties ripened fruit. All varieties, except two, bore fruit. The highest yield was five pounds of ripe fruit from a vine.

SESSIONAL PAPER No. 16

Vegetables.—Variety tests of vegetables were continued again in 1919 and a large number of varieties were grown under comparative conditions.

Grounds.—A large assortment of annual flowers were grown. These in conjunction with the perennial borders and shrubs attracted much favourable comment. The large campus fronting the river was levelled and seeded to Kentucky blue grass for lawn.

FARM IMPROVEMENT

A much needed bull barn was built during the year, providing large box-stalls for four bulls, with doorways to the south so that the doors may remain open most of the time allowing the bulls continuous yard exercise. The north gable of the main barn was double boarded and battened to prevent driving storms from beating through. Two brooder houses were also built.

CLEARING LAND

Five acres of new land was stumped, burned and ploughed during the summer. A great many boulders were broken up and removed from various fields, and all stone coming to the surface during ploughing and cultivation in all fields were cleaned up.

EXHIBITIONS

Exhibits were made at the Provincial Exhibition, St. Stephen, and the Interprovincial Exhibitions at Fredericton and Chatham, where literature was distributed, applications for seed samples, etc., received and a continuous discussion conducted with visitors on the work of the Experimental Farm System and agriculture generally. A live stock exhibit at the Maritime Winter Fair, with 18 animals, drew seventeen awards.

MEETINGS ATTENDED

The Superintendent and assistant to the Superintendent addressed various meetings throughout the province, and attended the sessions of the Farmers and Dairymen's Association, and New Brunswick Fruit-growers at Fredericton. The Superintendent also attended meetings of the Maritime Stock Breeders' Association, the Nova Scotia Farmers' Association and the New Brunswick Potato Growers, and the assistant attended the Maine State Pomological Society's annual meeting at Bangor, Maine.

EXCURSIONS

The New Brunswick Fruit Growers' Association had a field day on August 28 and visited the Experimental Station among other orchards. Lunch was provided at the Station for one hundred and fifty visiting fruit-growers. The New Brunswick Farmers' and Dairymen's Association visited the Station on March 18 and dinner was given to two hundred and fifty visitors. They were given addresses by the Superintendents of the Kentville and Fredericton Stations, the assistant Superintendent of the Fredericton Station, and by Mr. Geo. E. Sanders, of the Dominion Entomological Branch. Live stock demonstrations and discussions were also conducted.

11 GEORGE V, A. 1921

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE, QUE.

REPORT OF THE SUPERINTENDENT, JOSEPH BEGIN

CHARACTER OF SEASON

The winter of 1918-19 was mild with abundant snow, which protected the soil from early spring frost. The snow disappeared about two weeks later than usual. April and the first part of May were cold and rainy. The first work on the land was done on May 8, and the first sowing the next day. Germination was slow, the first shoots appearing above the ground about May 14, at which time seeding was becoming general in this district. There was a period of drought from May 25 to July 10, less than two inches of rain falling during that time; but after the latter date rainfall was abundant. This, however, was too late for the hay, which gave a crop below the average. The grain harvest in the district suffered from late season and slow early growth owing to drought. The yield was, therefore, reduced and the crop was only fair. Roots and potatoes gave a good crop on the whole. Apples were fair, but plums, usually abundant in this district, yielded almost nothing. Small fruits yielded very poorly, both in quantity and quality, a frost on the 30th of May having done considerable injury to the buds. The winter of 1919-20 has been remarkable for light snowfall and intense cold during its early months. The soil froze deeply and water supplies were frozen up to a great depth by the end of December so that the shortage of water was more severe than it has been for many years.

LIVE STOCK

Horses.—There are at present on the Station twenty horses kept for the purpose of doing farm work and for carrying on breeding experiments. Of the above number eleven are registered Percherons, seven of them being mares varying in weight from 1,500 to 1,750 pounds, a three-year-old stallion, two youngsters of two and three years of age respectively, and a young spring colt. No feeding experiments were carried on with these during the last year, the object in view being to keep the horses in good condition for work, and to maintain the young stock in good growing condition with the least possible expenditure for purchased feeds.

Cattle.—The whole herd at present comprises 66 head of all breeds and ages divided as follows: 38 pure-bred registered Ayrshire and 28 common grades and Ayrshire grades. The Ayrshire herd is headed by a very good bull used with the pure-bred Ayrshire herd and with the Ayrshire grades; 17 milch cows from two to ten years of age; eleven young bulls from one to two years of age and nine spring calves. The cross-bred herd is made up of five milch cows, seven young grade Ayrshire heifers, nine bulls of the first Ayrshire cross and seven grade spring calves.

Fourteen Ayrshire completed their lactation period during the year. These gave a total of 81,214 pounds of milk during a period averaging 339 days per cow. The average yield of milk was 5,801 pounds per cow, or a daily average of 17.1 pounds. The average per cent of butter fat was 4.0143.

Twelve Ayrshire crosses also completed their lactation period during the year. They produced a total of 58,873 pounds of milk during an average lactation period of 315 days, giving an average yield per day of 15.5 pounds. The percentage of butter fat was slightly less than that given by the pure-bred herd, viz., 4.20. A number of young stock were sold during the year, some to local butchers, others to farmers for breeding purposes.

SESSIONAL PAPER No. 16

Swine.—At the close of the year the herd of swine consisted of a good Yorkshire boar, four sows from one to three years of age, five young sows and three young boars less than a year old. No feeding experiments were carried on during the year. The object in view was the production of pork as economically as possible using the feeds produced on the Station with the smallest possible amount of purchased concentrates. Among the farm feeds those produced commonly on farms in Eastern Quebec were used, such as clover, forage beets and sugar beets. These were used especially in connection with winter feeding of sows, young growing pigs, autumn pigs after weaning and also for young spring pigs, which were being raised on pasture. Some valuable information was obtained in this work. Notes were also taken on the advantages of portable cabins for the wintering of sows and boars.

Sheep.—A flock of pure-bred Shropshires and a flock of Shropshire crosses are being formed. The total sheep on hand at the end of the year was 66. 22 lambs were sold during the year and 307 pounds of wool.

POULTRY

The two utility breeds, White Wyandotte and Plymouth Rock, are kept at the Station. The flock is only a small one but wider experimental work is being planned for the coming year.

BEES

Both the native black bees and the hybrid Italians were kept. Eighteen colonies were wintered in the cellar and 8 in boxes out of doors, each box containing 4 hives. The bees wintered in the cellar came through satisfactorily only a single colony being lost; those wintered outside all wintered well. The spring was not favourable for early work with the bees. The production of honey was delayed by cold weather, and consequently was very short. The average yield per hive was 62 pounds as compared with 95 pounds the previous year.

FIELD HUSBANDRY

Rotations.—Four rotations of three, four, and five years are carried on regularly. The four-year rotation is carried on in duplicate on drained and undrained land. The three-year rotation is certainly the best adapted to high production of crops suitable for a dairy farm and for the raising of young cattle. This rotation requires more work but it produces more abundantly. Consequently, it is well suited to small farms having a certain area of natural pasture. The four-year rotation permits of keeping up the fertility of the soil, lessens labour on account of having two consecutive crops of hay and thus is well adapted to the system of farming pursued in eastern Quebec. On farms not having natural pasture, this rotation provides for a large area of hoed crops, an area under grain, a hay crop and pasture. The five-year rotation is planned for farmers wishing to grow more grain. It differs from the two former ones as it commences with a grain crop seeded down to clover to be ploughed down along with barnyard manure the next spring; this is followed by a hoed crop, grain the third year, clover hay or pasture the fourth year, and millet or pasture the fifth year. This rotation allows for the improvement of larger areas with less manure since the clover ploughed down adds to the fertility. The yields from all the rotations were good with the exception perhaps of hay, which was a little below the average of the three former years.

CEREALS

The average yield of all the cereals except peas, was slightly lower than the average of the three preceding years. The only apparent reason for this lighter yield was the late date of seeding. The average yields were as follows:—

Wheat—			
Huron..	38	bu.	20 lb.
Marquis..	35	"	15 "
Ruby..	32	"	25 "
Oats—			
Banner..	64	"	10 "
Daubeney..	58	"	22 "
Ligowo..	56	"	—
Barley—			
Manchurian..	36	"	20 "
Albert..	31	"	10 "
Success..	24	"	12 "
Peas—			
Arthur..	34	"	40 "

HORTICULTURE

For lack of suitable land, a large portion of the experimental work in horticulture was not carried on last season. With potatoes, the chief experimental work was the testing of different sprays to prevent disease. A large quantity of cabbage, beet, carrot and lettuce and flower seed was gathered in good condition. This was intended for a small local distribution.

The trees winter-killed in 1917-18 were replaced in the spring. These established themselves perfectly and made good growth, ripening their wood well before winter. The yield of plums was the lightest in many years, the European varieties did not produce at all. The Lombardy poplars planted as a protection around the orchard made an average growth of 5 feet 7 inches during the year.

FARM IMPROVEMENTS

Considerable work was done in removing stone from the cultivated fields, in draining certain areas, and in the general improvement of those portions of the farm intended for experimental work with cereals and forage plants. The surface drains were also greatly improved on the level part of the Farm. A main 6-inch drain was put in for about 1,600 feet to improve conditions about the barnyards and vicinity. Necessary repairs were made to several buildings on the Station.

EXCURSIONS AND EXHIBITIONS

Exhibits of farm produce were made at the county fairs of Bellechasse, Montmagny, L'Islet, Kamouraska, Rimouski and Matane, and the Station also exhibited at the seed fairs held in the same counties during the winter.

Over 4,000 farmers visited the Station during the summer, and were present at practical demonstrations in the various lines of farm work. The Farm was also visited by members of the Council of Agriculture of Quebec and by the teachers and pupils of a number of schools and agricultural institutions.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, G. A. LANGELIER

CHARACTER OF THE SEASON

The six months during which plants grow in central Quebec were warmer, dryer and brighter than the average of eight years, the mean temperature being respectively 57.48 and 56.27° F., the precipitation 25.43 and 25.87 inches, the number of hours of sunshine, 1123.5 and 1084.5. The frost-free season lasted 138 days, from May 15 to October 1, which is exactly the average length since 1912. The following were very good: silage corn, timothy, currants, gooseberries, cabbage, cucumber, egg plant, garden peas, lettuce, parsley, sweet corn, barley, clover, potatoes, apples, grapes, strawberries, cauliflower, garden beans, muskmelons, ornamental shrubs, perennials; oats, wheat, raspberries, Brussels sprouts, carrots, celery, garden beets, onions, parsnips, annual flowering plants, bulbs were medium; field peas, roots, cherries, pears, plums were practically a failure.

METEOROLOGICAL RECORDS, 1919-20.

Month	Temperature F.			Precipitation				Sunshine
	Highest	Lowest	Mean	Rainfall	Snowfall	Total	Heaviest in 24 hours	Total Hours
1919								
April.....	56.0	8.2	34.28	1.81	13.00	3.11	0.60	117.6
May.....	80.0	29.2	51.05	3.49	.....	3.49	0.90	214.7
June.....	93.0	38.2	65.16	3.20	.....	3.20	1.28	228.0
July.....	90.0	45.2	67.40	7.10	.....	7.10	1.74	220.5
August.....	81.0	43.2	63.39	3.39	.....	3.39	0.97	207.7
September..	80.0	32.2	55.31	4.21	.....	4.21	0.72	129.1
October.....	62.0	21.2	42.57	4.04	.....	4.04	0.75	123.5
November.....	49.0	5.2	30.45	2.25	12.50	3.50	0.80	51.5
December.....	39.0	-25.8	9.64	0.40	11.90	1.59	0.30	67.4
1920								
January.....	32.0	-29.7	1.93	0.00	35.00	3.50	0.80	71.1
February.....	39.0	-25.8	18.51	0.00	34.00	3.40	0.80	67.0
March.....	55.0	-19.9	24.33	1.86	18.50	3.71	1.30	142.0
Total				31.75	124.90	44.24		1,640.1

LIVE STOCK

In general, all live stock kept in very good condition throughout the year.

DAIRY CATTLE

The herd numbered 60 head on March 31, 1920, which is an increase of 13 over last year. There were 57 pure bred and 3 grade French Canadians. They are kept mainly for experimental work, but the sale of high-class breeding animals and clean dairy products brings in a good revenue.

Milk Production.—Eighteen heifers and cows, ranging in age from 2 to 14 years, finished a lactation period during the fiscal year. Their average production was 5,127 pounds of milk testing 4.4, which is equivalent to about 260 pounds of butter per

11 GEORGE V, A. 1921

year. Seven poor milkers, sold since, are included in the above lot and it is interesting to note that, had they not been in the herd, the average production would have been 5,906 pounds of milk testing 4.5, which is equivalent to over 300 pounds of butter per year.

High Class French Canadian Cattle.—There are now, at the Cap Rouge Station, more cows and heifers which have qualified for Record of Performance than in any other herd. The four first daughters of the senior herd sire, entered in the test easily went through, which brought in the bull. As his dam qualified three times and is entered for the fourth, Delphis de Cap Rouge 3283 should throw some good milkers.

EXPERIMENTAL BREEDING OF DAIRY CATTLE

Project No. 135—Comparing methods of breeding dairy cattle.—The object is to compare close breeding, line breeding, and outcrossing. A cow is bred to her son, then to a bull in the same line, and lastly to a sire not related to her. The offsprings are compared for milk production, vitality and conformation. This was commenced in 1915 and it is yet too early to draw conclusions.

Project No. 1—Grading up a dairy herd.—This project was started in 1911 to find out if heifers out of grade cows, by a pure bred bull, would be better milkers than their dams. The sire used was an outstanding exhibition animal but not one of his daughters could qualify for Record of Performance though the dams of many of them had that distinction. This seems to indicate that the word "scrub" may sometimes apply to pure bred animals.

Project No. 134—Increasing milk production with a pure bred sire of known ancestry.—A grade French Canadian, Kate, gave 548 pounds of milk during the month following her first calving at Cap Rouge. To the service of a bull of unknown ancestry, she dropped a heifer, Reine, which gave 166 pounds of milk during the month following her first calving. Reine, bred to a bull whose dam qualified for Record of Performance, produced Francoise which gave 736 pounds of milk during the month following her first calving.

EXPERIMENTAL FEEDING OF DAIRY CATTLE

Project No. 4—Feed requirements of dairy heifers until calving.—All feed given to eight heifers was weighed until their age averaged 27 months 18 days. At this age their weight was 813 pounds. Each of them consumed 536 pounds whole milk, 5,668 pounds skim-milk, 881 pounds meal, 3,164 pounds hay, 377 pounds green feed, 4,235 pounds roots, 5,521 pounds corn ensilage besides being 96 days on pasture. It is easy to see that, at present prices for feeds, it costs a good deal to keep a heifer until she calves, which means that only good ones should be raised.

Project No. 3—Whole milk vs. skim-milk and supplements for calves.—Since 1917, three lots of calves, comprising 29 different animals, were fed differently until twenty-four weeks of age, one bunch receiving whole milk, the second, skim-milk and commercial calf meal, and the last, skim-milk and home mixed calf meal consisting of 6 parts corn, 3 parts oats, 1½ part flaxseed, by weight, all ground together. Calculating feed at the valuations of the start, in April, 1917, viz., whole milk at \$2, skim-milk at 25 cents, home made calf meal, also commercial calf meal, at \$5 per 100 pounds, bran at \$40, hay at \$15, silage and roots at \$4 per ton, it cost \$49 for each of the whole milk calves, \$17.51 for each of the commercial meal calves, and \$16.79 for each of the home-mixed meal calves. During the test, the average increase in weight of the whole milk calves was 228 pounds, of the home meal calves, 219 pounds, and of the commercial meal calves, 168 pounds.

SESSIONAL PAPER No. 16

EXPERIMENTAL HOUSING OF DAIRY CATTLE

Project No. 6—Keeping cattle in single boarded open front sheds.—Since 1915, three bulls have been kept all the year around in single boarded open front sheds, whilst two heifers, during the winter of 1918-19, and six, during the winter of 1919-20, received the same treatment. All these animals remained in fine health and did not seem to be at all affected by the cold weather.

EXPERIMENTAL MANAGEMENT OF DAIRY CATTLE

Project No. 5—Extra good vs. average rearing of heifers as influencing size and type, and production of the mature cow.—Twins were chosen for this experiment, so as to minimize the chance of error due to breeding. One of them, Eglantine de Cap Rouge 4159, was well fed, weighed 815 pounds just previous to dropping her first calf and gave 5,972 pounds of milk, qualifying for Record of Performance, during the first lactation period. The other, Elegante de Cap Rouge 4160, came in heat a couple of months later than her sister, aborted, was served again, weighed 645 pounds just previous to dropping her first normal calf and gave only 1,944 pounds of milk during this lactation period. This experiment is continued with other heifers, whilst a careful record will be kept of the two above mentioned.

HORSES

There were 61 horses on the Station on March 31, 1920, which is an increase of 34 over last year. There are 55 pure-bred French Canadians amongst the lot, and most of these are for the new Horse Farm at St. Joachim, Que. They are kept for experimental purposes, but the work which they perform and the sale of the colts are to their credit.

Work on the Farm

In a breeding establishment the number of hours of work of horses may be high and still the actual amount of work performed low, because youngsters and brood mares must receive special attention. This is the reason for discontinuing to give in this report the number of work hours. In general, too many horses are kept on farms, and by carefully planning operations or even by using a tractor when conditions warrant it, the number of work animals may be decreased. Breeders of good stock will not suffer from this, as high-class animals will continue to command remunerative prices.

High-class French-Canadian Horses

The studs of French-Canadian horses at Cap Rouge and at St. Joachim are admitted by everybody to contain the best and largest collection of these animals in existence to-day. In co-operation with the French-Canadian Horse Breeders' Association, it is intended to regenerate the breed and to form a class of horses weighing between 1,200 and 1,300 pounds which will not look out of place on the surrey or on the plough.

EXPERIMENTAL BREEDING OF HORSES

Project No. 7—Comparing methods of breeding horses.—This is to compare close breeding, line breeding and out-crossing. A mare is bred to her own son, to a stallion in the same line, and to a sire not related to her. The offspring is compared for constitution, size and conformation. It is yet too early to draw conclusions.

11 GEORGE V, A. 1921

EXPERIMENTAL FEEDING OF HORSES

Project No. 11—Feed requirements of work horses.—All the feed eaten by a team was weighed during two and a half years. Their average weight was 1,270 pounds at the beginning of the experiment and 1,273 at the end. Each of them worked 1,736 hours and ate the following quantities of feed: 5,809 pounds hay, 6,604 pounds oats, 1,034 pounds bran, and 95 pounds molasses. Prices fluctuate so much nowadays that it seems useless to state how much horse labour has cost per hour, according to the above experiment, but it is easy for anybody to find this out at current prices. The above horses ate a little over $1\frac{1}{2}$ pounds of hay and 2 pounds of concentrates per 100 pounds of their live weight, per day. This is somewhat more than is generally recommended, but they also worked more hours than farm teams generally do and they were kept in the best of condition at all times.

Project No. 10—Feed requirements of young horses until of working age.—All feed given to two colts and seven fillies was weighed until they were fit to work, when their average age was 33 months and 9 days and their weight 1,265 pounds. Since weaned, at the age of five months, each had received 363 pounds skim milk, 4,018 pounds oats, 4,506 pounds bran, 10,326 pounds hay and had been at pasture six months. The amount of feed could have been decreased if more pasture had been available, but it is a fact that a young horse, ready to work, costs a good deal of money, which means that only good mares and stallions should be used, so as to minimize the number of culls.

EXPERIMENTAL HOUSING OF HORSES

Project No. 12—Keeping horses in single-boarded open front sheds.—Since 1913, twenty different young horses were wintered, during the first year of their life, in single-boarded open front sheds and, though the temperature went down as low as 34° F. below zero, never one was seen to shiver. Stallions are kept in sheds of this kind all the year around and brood mares have been wintered in the same manner.

EXPERIMENTAL MANAGEMENT OF HORSES

Project No. 8—Raising fall colts.—Since 1915, four colts were dropped in the autumn and weaned in the spring, which allowed the dams to do much more work during the cropping season. The youngsters were raised in loose boxes, which they shared all winter with their dams. There are two difficulties to be watched: the foals are liable to get too fat and top heavy, that is the weight of the body is too great for the limbs; and it is hard to get a mare, foaling in the autumn, to settle that year, as she generally goes until spring before she is safely in foal.

Project No. 9—Work vs. no work for brood mares.—The same mare was bred five years running and subjected to different ways of exercising. Two winters, she was used reasonably all the time until foaling; two others, she was kept outside, with a single-boarded shed as a shelter, until a few weeks before dropping her young, when she was put to medium work; and another time she was kept idle in a box stall to within a month or so of foaling, when she was worked moderately. She dropped a strong foal each time, which seems to show that if exercise is essential for the brood mare, the mode of exercising is not of importance.

SHEEP

The flock numbered 88 head on March 31, 1920, which is an increase of 25 over last year. They are all pure-bred Leicesters. The main point in keeping them is experimental work, but the sale of breeders and of wool brings in considerable money.

SESSIONAL PAPER No. 16

EXPERIMENTAL BREEDING OF SHEEP

Project No. 12—Rams out of prolific dams as sires of prolific ewes.—The same ewes are bred to rams out of prolific dams and also out of non-prolific dams. Records are kept not only of the number of offspring, but of their constitution, size, conformation, and fleece. It is yet much too early to draw conclusions, as this experiment was only commenced in 1916.

EXPERIMENTAL FEEDING OF SHEEP

Project No. 13—Winter feed requirements of breeding ewes.—During three years all feed was weighed which was given to 41 breeding Leicester ewes, of a little above medium size, for about 200 days, from the time in autumn when there was not enough good pasturage, until spring when grass was sufficient. Each ewe, during that time, ate per day 3.16 pounds of hay, 1.63 pounds of swedes, 0.93 pounds of oats, and 0.63 pounds of bran.

EXPERIMENTAL HOUSING OF SHEEP

Project No. 14—Raising lambs in single-boarded open front sheds.—The ewes are wintered in single-boarded sheds, with an open front facing about south. They are brought to the sheep barn a short while before lambing, but as soon as the youngsters are from a week to two weeks old, and after they have been docked and ear marked, they are sent back to the shed with their dams. Only two lambs, both triplets, were lost out of 72, in 1919 and 1920, so that this way of raising them looks like a good one.

POULTRY

The flock numbered 541 on March 31, 1920, which is an increase of 260 over last year. Out of that number there were 199 for the Quebec Egg Laying Contest and the Farm owned 342, all Barred Rocks. Whilst the main purpose is to do experimental work with them, the revenue from the sale of breeders, meat and eggs is not to be disdained.

Province of Quebec Egg Laying Contest

The Laying Contest for the Province of Quebec was placed at Cap Rouge and twenty pens of ten birds each, entered as follows on November 1, 1919: 70 Barred Rocks, 60 Single Comb Rhode Island Reds, 30 Single Comb White Leghorns, 10 Rose Comb Brown Leghorns, 10 Single Comb Black Leghorns, 10 White Rocks, 10 Canadians. All birds are to remain in the houses for the whole twelve months.

Egg Production

An average of 183 layers were kept during the year, and the total egg production was 15,816 eggs, which is 86 per bird. This is just half a dozen eggs per layer more than last year, or an increase of 7.5 per cent.

EXPERIMENTAL BREEDING OF POULTRY

Project No. 161—Pedigree work with poultry.—Pullets are trap-nested and only those kept for breeding purposes which laid more than 30 eggs during November, December, January, February, and more than 150 during the 12 months following the date on which they first laid. Eggs from each bird are placed in separate wire cages in the incubator, near the end of the hatch, with the number of the layer on each cage. The chicks are leg-banded before leaving the wire cage and a sealed band is put, three weeks later, through the thin part of a wing, so that their identity is never lost. The pedigree of each wing-banded bird can thus be traced as easily as that of horses, cattle, sheep or swine.

11 GEORGE V, A. 1921

Project No. 162—Hatchability of eggs and viability of chicks from good and from poor layers.—It is claimed by some that a hen which lays a great many eggs loses strength and cannot transmit to its off-spring the vitality necessary for large production. To throw light on this question notes are taken of the number of eggs laid by a certain number of good layers and a certain number of poor layers, the number placed in the incubator, the number of chicks hatched out and the number living at three months. No conclusions can yet be drawn.

Project No. 121—Hatchability of eggs and viability of chicks from pullets and from hens.—Will eggs from hens hatch better and produce stronger chicks than eggs from pullets, is a subject on which more light should be thrown. To help answer the question satisfactorily, notes are taken of the number of eggs laid by each lot, the number placed in the incubator, and the number of chicks hatched and living at three months. More data will have to be gathered before figures are given out.

EXPERIMENTAL FEEDING OF POULTRY

Project No. 79—Commercial grain vs. screenings.—This experiment has now run four seasons, November to February inclusive, each year. An average of 24 birds were in each of two pens and both received practically the same quantities of animal and green food, meal, grit and shells, one lot getting commercial grain and the other screenings. The average of four trials shows, that commercial grain gave more profit because the birds each increased in weight by about ten ounces. The number of eggs laid by each pen was practically the same, but, leaving aside the increase in weight of the birds, the cost of egg production was lowest with screenings.

Project No. 80—Roots vs. clover leaves.—This experiment was conducted during four seasons, November to February inclusive, each year. An average of 23 birds were in each pen and both received practically the same quantities of grain, meal, animal food, grit and shells, one lot getting roots and the other dry clover leaves. The birds receiving dry clover leaves took on a little more weight, laid better and produced eggs at a lower cost than those receiving roots. The dry clover leaves fed in this experiment were gathered on a barn floor and given in a box.

Project No. 81—Skim milk vs. beef scraps.—This experiment has now run four seasons, November to February inclusive, each year. An average of 25 birds were in each pen and both received practically the same quantities of grain, meal, grit and shells, one pen getting skim milk and the other beef scraps. The skim milk pen gained a little more weight and produced eggs for about half the price of the beef scrap lot.

Project No. 82—Water vs. snow.—This experiment was conducted during four seasons, November to February inclusive each year. An average of 22 birds were in each pen and both received practically the same quantities of feed, one pen getting water and the other snow as soon as it was available in the autumn and all through winter. The pen getting snow laid a little better and the cost of egg production was somewhat lower for them.

EXPERIMENTAL HOUSING OF POULTRY

Project No. 83—Winter temperature in poultry houses of different widths.—For five years, during November, December, January, and February, the highest and the lowest temperature were taken outside, in a colony house 8 feet wide, in a laying house 12 feet wide, and in another house 16 feet wide. All these buildings were of the shed roof pattern, had about twice the area of cotton as of glass and were placed so as to be about equally sheltered from the wind and to get about the same amount of sun. The average difference between the highest and the lowest temperature, during all that time, was 38.1 degrees outside, 24.9 in the narrow house, 23.3 in the colony and 21.7 in the wide house.

SESSIONAL PAPER No. 16

EXPERIMENTAL MANAGEMENT OF POULTRY

Project No. 84—Comparison of layers at different ages.—For this experiment, four pens of about 25 birds each were used, five years in succession, from November to February inclusive. If the cost of production of one dozen of eggs, during winter, is taken as 100 for early pullets, hatched before May, it would be represented by 249 for yearling hens, by 280 for late pullets, hatched after April, and by 848 for two year old hens. A remarkable thing is that a pen of early pullets, giving by far the highest profit one winter, went down to second place when, the following year, they were compared, as yearlings, with another pen of early pullets.

EGG PRESERVATIVES

Project No. 78—Comparison of different methods of preserving eggs.—Eight different ways of preserving eggs have been tried for four years, viz., lime water, water glass, wrapping in paper and leaving alone, wrapping in paper and turning daily, putting away in oats, putting away in sawdust, and two commercial preservatives. Samples were tested at the Chemical Division, Central Experimental Farm, Ottawa, and at the Cap Rouge Station. Up to the present, only lime water and water glass have given full satisfaction.

BEES

Eleven colonies were kept during 1919, which is one less than the previous year. They are mostly hybrids.

Production of Honey

The season was a very bad one in the district of Quebec for the production of honey. The reason for this, according to beekeepers of long experience, is that the weather was bad, either rainy, cloudy or extremely windy, during the very short period when bees gather honey. The greatest yield from one colony at the Station was 32 pounds, which shows how poor the crop was.

Experimental Feeding of Bees

Project No. 16—Comparison of different kinds of stores for winter feeding of bees.—During the last four winters, some colonies were fed early gathered honey, others late gathered honey, others early gathered honey and sugar syrup, and others only sugar syrup. Results, to date, are contrary to expectations, as the bees fed on sugar alone and on late gathered honey only, have done practically as well as those fed on early gathered honey alone and on early gathered honey with sugar. It would thus seem better to await further experimental work before coming to conclusions.

FIELD HUSBANDRY

Work for this Division comprises agricultural engineering, crop management and soil management.

AGRICULTURAL ENGINEERING

Owing to the scarcity of funds, very little could be done during 1919 at clearing land, draining, fencing and road making. A good horticultural barn was put up, with a large under-ground cellar of 40x25, and rooms for washing vegetables, packing small fruit, and storing seeds.

CROP MANAGEMENT

Project No. 36—Field Crop Areas and Yields.—Corn, hay and barley were a better crop than usual, whilst swedes, oats, wheat and peas were lower.

Crop	Yield per acre in pounds		
	1919	Average	For
Longfellow corn....	20,929	16,496	8 years
Good Luck swedes.....	11,410	23,599	8 years
Timothy hay.....	4,530	3,772	8 years
Clover hay.....	4,256	4,197	8 years
Banner oats.....	1,175	1,701	8 years
Manchurian barley.....	1,475	1,179	6 years
Huron wheat.....	1,528	1,647	5 years
Arthur peas.....	1,260	1,408	5 years

Project No. 35—Cost of production of field crops.—Since 1913 inclusive, accurate records have been kept on 106 acres, for the three main crops of the district, swede turnips, oats and hay, with the following results:—

Crop	1919		Average for seven years	
	Yield per acre	Cost	Yield per acre	Cost
	lbs.		lbs.	
Good Luck swede turnips.....	11,460	\$10 82 per ton...	24,628	\$3 70 per ton.
Banner oats.....	1,339	0 59 per bush.	1,804	0 39 per bush
Clover and timothy hay.....	4,378	7 35 per ton...	4,540	6 12 per ton

An increase in yield lowers the cost per acre, invariably, in the above cases.

Project No. 43—Different rotations.—A three, four, a five and a six-year rotation have been compared for nine years. Contrary to expectations, the profit seems to be greater as the rotation is lengthened, but it is also easily seen that the land is getting weedier each year on these longer rotations. This is work which must be continued for a great many years before reasonable conclusions can be arrived at.

Project No. 38—Different rates of sowing oats.—This experiment, commenced in 1913, comparing thirteen different rates of sowing oats, from 1 to 4 bushels inclusive, going up by a quarter of a bushel, has been run on a sandy loam of better than ordinary fertility. The average, for seven years for the five best rates giving the yield in pounds per acre, less the amount of seed used, is as follows: 3½ bushels, 2,025 pounds; 2½ bushels, 1,995 pounds; 3¼ bushels, 1,965 pounds; 2¾ bushels, 1,890 pounds; 3 bushels, 1,868 pounds. Until more light is thrown on the subject, it is recommended to sow 2 1/2 bushels per acre on soil such as the above mentioned.

Project No. 39—Different rates of seeding timothy, red clover and alsike mixed.—Since 1912 inclusive, 148 plots of 1 60 acre each were used for this project. On half of this number of plots, 12 lbs timothy, 8 pounds red clover and 2 pounds alsike were sown per acre, with Banner oats as a nurse crop, whilst the others only received half of these quantities. The thick seeding gave 193 pounds more hay per acre, or only an increase of about 4 per cent, which shows that on a sandy loam where fertility is not as necessary to sow large quantities of grass and clover seed as on a piece of badly worked land.

SESSIONAL PAPER No. 16

Project No. 40—Yield of clover hay after different kinds of nurse crops.—Since 1912, all the trial plots, 378 in number, were seeded down with timothy, red clover and alsike, at the rate of 8, 12 and 2 pounds respectively per acre. The crop of clover hay was at the rate of 2 tons and 1,393 pounds per acre after barley, 2 tons 1,237 pounds after wheat, 2 tons 953 pounds after oats, 1 ton and 1,898 pounds after peas.

Project No. 41—Yield of clover hay with different rates of sowing oats.—For seven years, Banner oats was sown at different rates and the crop of clover was weighed the following year, to see after which density could be had the largest quantity of hay. Contrary to expectations, the rates above 2 1/2 bushels of oats per acre have been followed, in general, by a larger crop of clover hay than those below. It is interesting to note that the average rate of 2 1/2 bushels of oats per acre has been followed by exactly the average of the clover crop for all densities.

SOIL MANAGEMENT

Project No. 42—Spring vs. autumn ploughing for silage corn.—The average of three years is all in favour of fall ploughing, as the yield was 16 per cent more and the land was freer of weeds, which necessitated less hand labour. This is no small plot work, as all the crop was weighed on 26.40 acres.

CEREALS

Experiments were continued with the main cereals of the district, grown singly and in mixtures.

Project No. 19—Improvement of barley by selection.—In 1914, this project was started with the results that for 1918 and 1919 the Cap Rouge selection is at the head of the six varieties in the trial plots.

Project No. 23—Variety tests of barley.—Since 1911, seventeen varieties and strains of two-rowed and six-rowed barley were tried and nine of them were dropped because they did not yield enough. The highest yielder, in 1919, was Cap Rouge selection of Manchurian which yielded at the rate of 1,860 pounds, or about 39 bushels per acre, and came to maturity in 86 days. The above variety is the one recommended to farmers of this district.

Project No. 140—Variety tests of field beans.—In 1919, two varieties of field beans were tested. The Norwegian produced at the rate of 1,633 pounds per acre and the Yellow Rye at the rate of 865 pounds. Both took about the same time, 103 days, to mature. The difference in yield was probably due mostly to the freeness of disease in the Norwegian.

Project No. 25—Variety tests of flax.—Since 1915, two varieties of flax have been tried. Longstem, more adapted to the production of fibre, had an average length of about three feet, took 104 days to mature and produced at the rate of 559 pounds of seed per acre, whilst Novelty had an average length of some two feet, took 109 days to mature and produced at the rate of 811 pounds of seed per acre.

Project No. 26—Variety tests of oats.—Since 1911, fourteen different varieties and strains of oats have been tried and seven of them were set aside because they did not yield enough. Banner is the one which is recommended here. For an average of eight years, it produced at the rate of 2,244 pounds, or 66 bushels, per acre and came to maturity in 99 days.

11 GEORGE V, A. 1921

Project No. 34—The influence of the preceding crop on the cooking qualities of field peas.—Arthur peas have been used three years for this experiment. The average results show that if the time to cook field peas grown after grain is 100, it would be represented by 139 for those grown after a hoed crop and by 170 for those grown after sod.

Project No. 24—Variety tests of field peas.—Since 1911, twelve varieties or strains of field peas have been tried and eight of them were dropped because they did not yield enough. Arthur is the variety recommended to farmers of the district. For an average of eight years, it yielded at the rate of 1,905 pounds, or about 32 bushels, per acre, and took 97 days to come to maturity.

Project No. 22—Improvement of spring wheat by selection.—In 1913, this project was started, with the result that, for 1918 and 1919, the Cap Rouge selection stands second, for yield, amongst the eleven varieties which were in the trial plots.

Project No. 21—Variety tests of spring wheat.—Since 1911, twenty varieties and strains of spring wheat have been tried and eleven set aside because they were low yielders. Huron is recommended to farmers of the district. Its average production, for nine years, is 1,280 pounds, or over 21 bushels, and it took 100 days to come to maturity.

Project No. 18—Mixtures for grain production.—Since 1912, twelve different mixtures were tried for grain production, but these have been cut down to five, as the others did not yield enough. In general, mixtures have not yielded as much per acre as the different grains sown alone. Another disadvantage is that a farmer generally feeds the mixture as harvested, when the proportion of each grain is often not what it should be for the purpose.

FORAGE CROPS

Investigations were continued with the forage crops suitable for this district.

Project No. 57—Improvement of alfalfa by selection.—This was started in 1915 with Grimm seed which was sown on an exposed place, so that by natural selection, the plants not strong enough to withstand the rigors of winter could be rogued out. Then 600 plants were put in and progeny record notes are kept from the most promising.

Project No. 56—Variety tests of red clover.—This project is to compare different varieties or strains of red clover as to hardiness, yield and number of crops they will produce. Three varieties are on test: the ordinary commercial red clover, a variety from Sweden, and a C.E.F. strain which is said to be perennial. A careful record will be kept of the date of cutting, the yield, and the percentage living the second, third, and fourth years.

Project No. 44—Variety tests of silage corn.—Since 1913, twenty-two varieties or strains of corn were tested for silage production. Longfellow is recommended to farmers of the district. For an average of six years, it yielded forage at the rate of 18,339 pounds per acre.

Project No. 45—Variety tests of field carrots.—Since 1911 nineteen varieties or strains of field carrots were tested. Improved Short White is at the top with a production of 16,474 pounds per acre, for an average of eight years.

Project No. 55—Methods of helping the germination of mangel seed.—The results of twelve different tests made in flats, in the greenhouse, show that if the check is taken as 100, soaking seed in water for fifteen hours would give a germination of

SESSIONAL PAPER No. 16

106; soaking seed in a mixture of liquid manure and water for fifteen hours, of 104; packing the soil, of 99; watering every day, of 99; packing the soil and watering, of 95; mixing a complete fertilizer with the soil as in harrowing, of 84; applying a complete fertilizer in the row with the seed, of 55; mixing salt with the soil as in harrowing, of 48; applying salt in the row with the seed, of 14.

Project No. 53—Variety tests of swede turnips.—Since 1911 forty-eight varieties and strains of swede turnips were tested. Good Luck is recommended to farmers of the district. For an average of nine years, it has yielded at the rate of 34,701 pounds per acre.

Project No. 157—Trueness to type of swede turnips produced from commercial seed.—In 1919, seed was obtained from the trade of fifty-one varieties or strains of swede turnips. When the crop was pulled, a careful examination showed that 36 or 71 per cent were true to type and 15 or 29 per cent were not. Of these 15, 5 were not of the right colour, and ten were not of the right shape. Of the latter ten, 2 were 5 per cent off, 5 were 10 per cent off, 2 were 15 per cent off and 1 was 50 per cent off.

FERTILIZERS

Project No. 141—Influence of phosphoric acid in promoting maturity of corn.—The result of this experiment, for one year, shows that the addition of about 500 pounds of acid phosphate, per acre, to twenty tons of good barnyard manure on a sandy loam of better than average fertility, made no difference in the degree of maturity and, moreover, did not increase the crop.

HORTICULTURE

Experiments in horticulture relate to fruits, ornamental plants, and vegetables.

FRUITS

Projects on hand deal with apples, cherries, pears, plums, grapes, black currants, red currants, white currants, gooseberries, strawberries and raspberries.

Project No. 91—Comparison of different cover crops for an apple orchard.—The object is to find out a good cover crop for an orchard. The following are compared: red clover sown every year; vetches sown every year; rape sown every year; clover followed by rape in a two year rotation; permanent sod, hay used as mulch for trees; permanent sod, hay taken away. It is remarkable that, for an orchard planted in 1913, the growth is much weaker where there is a permanent sod.

Variety Tests

Project No. 87—Apples.—About 150 varieties, consisting of some 900 trees, were on test. The largest crop was from an Okabena planted in 1911 which gave 38 gallons of fruit. The best apples adapted to this district are Yellow Transparent, Lowland Raspberry, Red Astrakan for summer; Duchess, Montreal Peach for autumn; Wealthy, Milwaukee, Wolf River, Fameuse, McIntosh Red, McMahon White for winter.

Project No. 86—Cherries.—None of the sweet cherries is hardy enough for this district. Of the sour ones, 16 varieties, consisting of 55 trees, were on test. Most of these had been planted for 6 to 8 years and though some bore fruit previously, not one of them did so in 1919. Early Richmond, Griotte Morello, Montmorency Large, Orel No. 25, and Vladimir are promising for Central Quebec.

11 GEORGE V, A. 1921

Project No. 93—Pears.—There were 4 varieties of pears, consisting of 40 trees, on test. Though planted in 1913, they have not yet produced, and it is nearly sure that this is a fruit which will not be a success so far north. All the trees made a good growth in 1919 and were in fine condition in the autumn.

Project No. 76—Plums.—There were 32 varieties of plums, consisting of 130 trees, on test. Most of these were planted between 1911 and 1913. None of the Europeans fruited in 1919, but a few of the Americans did so, amongst which were Bixby and Mankato. Contrary to expectations, a larger percentage of the European varieties have lived at Cap Rouge than of the American varieties whose wood breaks much too easily.

Project No. 122—Grapes.—There were 28 varieties of grapes, consisting of 129 plants, on test. Many of these fruited in 1919, the ones which were nearest maturity being Manito, Champion, and Early Daisy amongst the blacks, Wyoming and Moyer amongst the reds, and Starr Early amongst the greens.

Project No. 68—Black currants.—Of the fourteen varieties of black currants on test for eight years, Climax leads with an average yield of 8,065 pounds per acre, followed by Saunders with 6,931 pounds and Topsy with 6,658 pounds. The highest yield was fruit or at the rate of 17,424 pounds per acre. They can be recommended for this district in the order mentioned above.

Project No. 69—Red currants.—Of the eleven varieties of red currants on test for eight years, Fay leads with an average yield of 9,272 pounds per acre, followed by Red Grape with 8,275 pounds and Red Cross with 7,951 pounds. The highest yield was obtained in 1919 from six plants of Red Cross, set in 1912, which produced 63.75 pounds of fruit or at the rate of 15,427 pounds per acre. For this district, Fay Perfection (7,798 pounds per acre) and Red Cross are to be recommended, as the fruit of Red Grape is too small and the clusters do not fill well.

Project No. 70—White currants.—Three varieties have been on test for eight years and have yielded as follows, per acre: White Cherry, 4,326 pounds, White Grape, 4,293 pounds; Large White, 3,584 pounds. The highest yield was obtained in 1916 from six plants of Large White, set in 1911, which produced 29.75 pounds of fruit or at the rate of 7,199 pounds per acre. White Grape, on account of its superior quality, is the most recommendable variety for this district.

Project No. 71—Gooseberries.—Of the eleven varieties of gooseberries on test for eight years, Houghton leads with an average yield of 19,821 pounds per acre, followed by Downing with 14,227 pounds and Queen Anne with 14,054 pounds. The highest yield was obtained in 1919 from six plants of Houghton, set in 1912, which produced 150.25 pounds of fruit or at the rate of 36,360 pounds per acre. The varieties to be recommended for this district are Silvia (13,560 pounds per acre), Downing and Queen Anne, the two first on account of the size and quality of the fruit and the latter because it is firm and a good shipper. Houghton is a heavy yielder, but though it might suit for canning purposes, its fruit is too small for ordinary markets.

Project No. 72—Raspberries.—A new plantation was made in 1919, so that this year is not included in the results. Of the six varieties of red raspberries on test for at least six years, Herbert leads with an average yield of 2,113 pounds per acre, followed by Brighton with 2,085 pounds and King with 1,971 pounds. The highest yield was obtained in 1916 from twelve plants of Herbert, set in 1912, which produced 36.5 pounds of fruit or at the rate of 5,445 pounds per acre. The varieties recommended for this district would be the ones mentioned above, in the order named, with a preference for King if extra earliness is wanted.

SESSIONAL PAPER No. 16

Project No. 74—Comparison of methods of planting strawberries.—The hill system is compared with the matted row. The average of two years shows a yield of 0.66 pound per plant for the first and 0.76 for the second. But as the plants were set 30 by 12 inches for the hill system and 42 by 12 inches for the matted row, the yield was at the rate of 11,651 pounds per acre in the first instance and 9,891 in the second.

Project No. 73—Variety tests of strawberries.—Of the twenty-four varieties of strawberries on test for at least five years, Valeria leads with an average yield of 9,077 pounds per acre, followed by Cassandra with 8,961 pounds and Portia with 8,226 pounds. The highest yield was obtained in 1916 from 46 plants of Portia, set in 1914, which produced 44 pounds of fruit or at the rate of 13,888 pounds per acre. Valeria is too small and not coloured enough; Cassandra is good in every respect; Portia is late and very firm to ship, but is an imperfect variety. Excelsior, with an average of 5,241 pounds per acre, is recommended for an early crop, whilst, of all commercial kinds, Dunlap, with an average of 7,705 pounds per acre, seems the best.

ORNAMENTAL PLANTS

Tests have been carried on with 370 varieties of annual flowers and bulbs, 170 varieties of perennial flowers, and 140 varieties of ornamental shrubs and trees. As a market proposition daffodils, sweet peas, asters, and delphiniums would be remunerative to a grower near a fair sized city. The best liked shrubs are the lilacs, hydrangeas, roses, spireas, and honeysuckle.

VEGETABLES

Tests were carried on with a number of varieties and strains of the following vegetables: Asparagus, 11 varieties; garden beans, 66; garden beets, 34; cabbage, 48; garden carrots, 48; cauliflower, 9; celery, 13; sweet corn, 69; cucumbers, 30; muskmelon, 6; onions, 33; parsnips, garden peas, tomatoes, potatoes, turnips and rhubarb.

Experiments in the improvement by selection of the following vegetables were carried on: Asparagus, garden beans, garden beets, cabbage, garden carrots, sweet corn, garden peas, and tomatoes. Some of this work was started several years ago and some in 1919. Before definite results can be secured it will be necessary to continue this selection for a number of years.

There were nineteen different cultural experiments with vegetables as follows: Yield of asparagus when plants are set at different distances; sowing garden beans—one vs. four varieties; yield of garden beets when plants are thinned to different distances; comparison of methods of protecting cabbage against root maggots; yield of garden carrots when plants are thinned at different distances; comparison of methods of protecting cauliflower plants against root maggots; comparison of methods of blanching celery; comparison of different sizes of onion sets for yield; comparison of yields of onions which have been sown, transplanted, or planted as sets; yield of onions when plants are thinned at different distances; yield of parsnips when plants are thinned at different distances; sowing garden peas—one vs. four varieties; comparison of different kinds of potato sets for yield; effect on yield of potatoes by plastering the seed; comparison of methods of treating rhubarb roots for forcing; comparison of methods of starting tomato plants; comparison of methods of training tomato plants; methods of pruning tomato plants; methods of artificially ripening tomatoes.

EXTENSION AND PUBLICITY

The work for this division consists in making exhibits at fairs and in distributing literature.

11 GEORGE V, A. 1921

Exhibitions

Exhibits were made at Three Rivers, Quebec, Baie St. Paul, St. Romuald, and St. Michel. It is estimated that over 65,000 persons saw the Station exhibit at these five places. Diplomas were received from the two large fairs, Three Rivers and Quebec. It is interesting to note that the greatest number of inquiries were about horticulture, bees, poultry, cereals, forage plants, live stock and field husbandry in the order named.

Publicity

At the above exhibitions, and from the Station, nearly 4,000 circulars and bulletins were distributed during the year, whilst a great many names were added to the mailing list of the Publications Branch.

DISTRIBUTIONS

The following all grown at Cap Rouge, were distributed during the fiscal year: 312 apple trees, 126 black currant bushes, 111 red currant bushes, 78 white currant bushes, 18 gooseberry bushes, 132 raspberry canes, 3,150 strawberry plants, 260 perennial flowering plants, besides 106 packages of tomato seed, 180 of flower seed, 62 of cabbage seed, 25 of potatoes, 5 of sweet corn, 4 of garden beans and 10 of field beans.

VISITORS

There came 4,945 visitors to the Farm during the year, besides the large numbers, sometimes over one hundred at a time, who visit the Station on Sundays or holidays. Anybody asking for information is given special attention and it would be hard indeed to find even a few persons who could say that they have not been courteously treated at Cap Rouge.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.**REPORT OF THE SUPERINTENDENT, J. A. McCLARY.**

THE SEASON

The weather throughout the month of April was dull and wet. Ploughing was commenced on April 19 and no seeding was done until May 8. The fine weather the latter part of May enabled farmers to get their seeding practically all completed.

The clover wintered very well and we commenced cutting the first crop on June 17, the second crop being used for silage purposes. The crop of hay in the district was above the average.

The grain crop was extra good and reaping was commenced on August 16. We commenced to harvest corn for silage purposes September 13. A very satisfactory yield was secured.

October was dull and wet, rain falling on fourteen days.

The first snowfall of the season was on November 5 when we had a fall of 8 inches, after which the weather was fine and a considerable amount of ploughing was done.

The weather in December was quite severe, the St. Francis river freezing over on the 16th, where a year ago it froze over January 7.

The weather through the winter was remarkably cold which was very hard on fruit trees and shrubs throughout the district.

SESSIONAL PAPER No. 16

METEOROLOGICAL RECORDS, 1919-20

Month	Temperatures					Precipitation			Total Sunshine Hours
	Maximum		Minimum		Mean	Rainfall	Snowfall	Total	
	Date	°	Date	°	°	Inches	Inches	Inches	
1919									
April..	23	68	4	0	37.43	1.32	13.6	2.68	103.9
May ..	23	77	6	25	51.75	2.99		2.99	213.8
June.....	5	93	29	30	64.33	3.19		3.19	248.7
July.....	4	92	8	40	65.82	3.18		3.18	239.6
August.....	7	83	12	35	62.19	3.59		3.59	196.8
September ..	21	83	27	26	54.81	4.31		4.31	138.2
October.....	10	74	30	18	43.93	6.63		6.63	103.0
November.....	8	58	28	— 4	32.14	1.29	14.5	2.74	52.6
December ..	13	45	18	— 23	11.37	0.45	6.0	1.05	98.3
January (1920)...	7	35	26	— 44	1.60		21.1	2.11	84.6
February....	3	44	1	— 47	12.65		19.0	1.90	85.6
March.....	25	66	2	— 33	55.32	0.79	23.0	3.09	150.5
Total		818		23	493.34	27.74	97.2	37.46	1,715.6
Average per month, 1919-20.....		68.16		1.91	41.11	2.77	16.2	3.12	142.9
Average per month, 1918-19.....		65.50		10.8	40.81	2.98	13.56	3.28	132.9
Average per month, 1917-18.....		65.75		4.25	36.39	3.45	16.8	3.29	130.9

LIVE STOCK

Horses.—There are at present eighteen horses at this Station, consisting of three registered Clydesdale mares, one registered Clydesdale stallion, one registered Clydesdale filly born in 1918, one registered Clydesdale filly born in 1919, one carriage horse, nine grade Clydesdales and two grade Percheron work-horses.

The mares are bred to foal in August or September so as to have the use of them in the spring when horse labour is so necessary in getting the crops in. The foals are run with their dams until March when they are weaned, and the mares put into condition for spring's work. Work-horses not needed in the winter are run in yards with good shelter and fed a ration consisting of 20 pounds hay, 30 pounds silage and 2 pounds bran per day.

Cattle.—The Ayrshire herd at this Station on March 31, 1920, consisted of forty head as follows: One aged stock bull, nineteen cows, two two-year-old heifers, seven yearling heifers and eleven calves.

The young stock from our herd sire, "Gardrum Bold Boy"—47138—is looking very promising and, with the excellent Record of Performance that this bull has back of him, we are looking for good results from his calves. This Station has never offered any females for sale as the policy of the Farm is to build up a herd from the small foundation we had to start with, in order to keep the herd as clean and healthy as possible. The young bulls are sold to farmers when from six to twelve months old, from which we expect to see good results.

Shorthorns.—Our Shorthorn herd consists of three cows, two two-year-old heifers, two yearling heifers, one heifer calf, one bull calf and one herd bull, "Kentville Tudor"—123902. This bull was bred at the Kentville Experimental Station from a dam in the Record of Performance test with a record of over 8,000 pounds milk. Three of these animals were purchased in the month of March as an acquisition to strengthen our present herd.

Beef Steers.—There was purchased in the fall of 1919 ninety-two steers which were tied in the barn on November 10. They were fed corn, clover silage and hay until January 15, when a light grain ration of 2 pounds per day was commenced and gradually increased to 7 pounds per day on May 12. These cattle were sold on May 12 and an average gain of 270·10 pounds was made.

Sheep.—The sheep at this Station comprise fifty-nine head as follows:—One registered Oxford Down ram, nine registered ewes, thirty-four grade Oxford ewes and fifteen shearlings. The wool and lambs from this flock are disposed of through the Sherbrooke County Wool Growers' and Sheep Breeders' Association, which has done much to enable the farmers to procure better prices for these products than heretofore by having the wool graded as well as the lambs so that they can be offered to prospective buyers by the different grades that they require, thereby receiving higher prices.

Swine.—There was on hand on April 1, one Yorkshire boar, five brood sows, twenty-four breeders and seventeen young pigs. We have sold throughout the year to the farmers in this district, a number of breeders from our lot, both males and females, which seem to be in good demand.

POULTRY

A start was made in poultry work on this Farm in the spring of 1919, by purchasing eggs and incubating them on the Farm. All chicks were hatched between May 15 and June 12 and were brooded in colony houses 10 by 12 feet in size, with coal burning brooders for heat. These houses were moved out into the field when the chicks were two months old to give more free range. A strict account of all the feed used during each month was kept and charged at market price. The feed used during the last two weeks in May was charged in the June account and the following is the average cost per chick for feed during the following months: June 3¼ cents; July 8½ cents; August 15½ cents; September 18¾ cents; and October 22½ cents.

To demonstrate the advantage of fattening poultry before marketing, two lots of cockerels were weighed before being put into fattening crates, valued at the local price for range birds and an account was kept of feed used to fatten them for three weeks. At the end of that time they were again weighed and valued at the local price for crate fed chickens alive, and then they were killed and marketed at best market prices.

Lot No. 1

No. Birds	Total Weight	Local price for range stock	Value	Live wt. after 3 weeks	Local price for quality	Value	Dressed Weight	Price	Value
45	148	0·26	\$38 48	209	0·30	\$62 70	185	0·41	\$75 85

Cost of feed for 3 weeks \$10·25 or 16¼ cents per pound of gain.

Lot No. 2

36	162	0·26	\$42 12	211	0·30	\$63 30	187	0·41	\$76 67
----	-----	------	---------	-----	------	---------	-----	------	---------

Cost of feed for 3 weeks \$8·80 or 17½ cents per pound of gain.

Sour skim-milk was used in Lot No. 1 to moisten mash instead of water, which accounts for better gains at lower cost per pound gain than in Lot No. 2.

SESSIONAL PAPER No. 16

It was found that the sale of cockerels and cull pullets left a balance on hand after paying cost of all feed until November 1. This left 215 pullets, some of which were commencing to lay and could not have been replaced for an average of \$2.50 each, on hand to commence paying their own way. These pullets were housed in straw loft type houses which have proved very satisfactory for this climate. All birds were trap-nested from November 1 and some very interesting records have been secured. The vast difference in various individuals in their ability to produce eggs is very marked. In the same pen, ten of the best individuals laid during the four winter months November 1 to February 29, 672 eggs or an average of over 67 eggs per bird, while the ten poorest producers only laid 118 eggs or an average of a little over 11 eggs each. The average producers only laid 118 eggs or an average of a little over 11 eggs each. The average price of eggs for the four months was 84 cents, therefore the eggs laid by the first ten would be worth \$47.04 while the eggs from the ten poorest producers would only amount to \$7.26. These birds were all of even maturity and under the same care. The average cost per bird for the four months was \$1.22 or \$12.20 per 10. Thus the 10 best producers would have a profit of \$34.84 while the 10 poorest producers would be a loss of \$4.94.

At the end of February all pullets which had not laid more than 25 eggs during the four winter months, November 1 to February 29, were culled out and disposed of as market poultry. The pullets which laid during same period more than 50 eggs were put into three pens and mated to pedigreed males which were purchased and were out of hens which had laid over 200 eggs the previous year. All chicks from those matings were pedigree banded and their number recorded for further selection. The remainder of the pullets were mated to males from high producing stock and the chicks from those matings were toe-punched. The incubator has been started again about March 20, and is doing good work so that prospects are promising for another year.

SUMMARY OF EGG PRODUCTION FOR FIVE MONTHS FROM NOVEMBER 1, TO MARCH 31, 1920.

Month	No. Pullets	Cost of feed	Eggs laid	Price sold	Total value	Profit	Loss	Average Eggs per bird	Average Profit per bird
		\$ cts.		cts.	\$ cts.	\$ cts.	\$ cts.		
November.....	215	46 55	306	90	22 95	.....	23 60	13	.....
December.....	206	62 17	2,142	90	160 65	98 48	.....	10 ³ / ₈	47 ³ / ₈
January.....	206	63 02	2,663	80	177 52	114 50	.....	12 ⁷ / ₈	56 ¹ / ₈
February.....	*205	64 05	2,124	75	132 75	68 70	.....	10 ³ / ₈	33 ¹ / ₂
March.....	†166	40 05	1,973	75	123 30	83 25	.....	11 ¹ / ₄	50 ¹ / ₈

*2 cockerels fed. †9 cockerels fed.

HORTICULTURE

Seasonal conditions at the outset of the spring of 1919 were quite promising for horticultural crops. For a brief interval in the early weeks of spring there was a spell of fine weather which gave every promise of an exceptional season; this lasted until June 28 and 29, when a very severe frost occurred which cut off potatoes, tomatoes and many of the other tender varieties of garden crops. It should be noted here, that some localities were affected more severely than others.

ORCHARDS

Cultural Apple Orchard.—Work was begun in this orchard early in the month of April, pruning and the removal of the paper protectors, etc., in preparation for the other operations.

11 GEORGE V, A. 1921

The replacing of the trees killed during the winter of 1917-18 was carried out to quite a degree, especially in the case of McIntosh, Fameuse, Scott Winter, Duchess, Wealthy, Alexander, Wolf River, Yellow Transparent, Dudley, Langford Beauty and Crimson Beauty.

It was considered to be worth trying to establish the better varieties of fruit trees once more and then if they killed out, some other policy could be adopted with regard to the planting of the orchard with varieties that would be hardier.

However, it was thought advisable to discard two of the varieties entirely, Blue Permain and Bethel, because of the heavy losses sustained since the orchard was first planted out. These two have been replaced with McMahon White and Patten Duchess.

From indications it seems that another variety will have to be discarded, that is Milwaukee, on account of the large percentage of the trees that have been killed.

Variety Apple Orchard.—There is a much better appearing lot of trees in this orchard than in the cultural, generally speaking, although in some parts of the orchard where the land is so wet, it has been found that a very hard impervious sub-soil exists, and the trees clearly show this area by their lack of vigour.

A very fine lot of trees are to be found on the hillside sloping to the north and another lot quite as vigorous at the extreme southeast corner of the orchard site. A set of under-drains has rendered the conditions somewhat better in this corner. This is very noticeable in the size and vigour of the trees.

The trees in both of the apple orchards ripened their wood in good time this year to withstand severe weather.

Plums.—The plums wintered well last year and many of them fruited. Of course the crop was small but some very good fruit was taken from the standard trees; of these Weaver and Omaha did the best.

Some of the seedling trees produced small crops; of these the following seemed to be outstanding: Gloria Seedling, O-436; Oren Seedling, O-423; Caro Seedling, O-419; Hawkeye Seedling, O-417.

Cherries and Pears.—The cherries and pears did better this season than in former years, but there is yet much to be hoped for so far as the development of the trees is concerned.

Grapes.—This part of the division did even poorer than any year past, which was due to a very large measure to the late frost which occurred June 28 and 29. At this time serious damage was done to the vines.

Raspberries.—A very good crop of fruit was harvested from some of the varieties this year.

It should be understood that in no wise are any of the canes layered in the fall of the year, this method of handling shows the hardiness of the varieties to good advantage.

King has proved the leader in hardiness and yielding ability, of course the fruit may not be quite as firm for shipping as Herbert, but there is plenty of quality in this variety to recommend it for growing in this district, when hardiness is such an important feature to be borne in mind.

Brighton, Count and Sarah follow next in order as to hardiness and yielding ability.

Currants.—There was a small crop from the bushes this season, but the quality of the fruit was very good.

Black.—Saunders, Kerry, Climax and Buddenburg.

SESSIONAL PAPER No. 16

Red.—Red Grape, Lees Prolific and Victoria.

White.—Cherry, Grape and Large White.

All the foregoing varieties are in order of merit.

Gooseberries.—The crop from this class of fruit was small again this year but the bushes are becoming well established.

Strawberries.—A very good crop of strawberries was obtained from the plantation and good prices obtained throughout the entire season.

The following varieties are recommended for this district: Senator Dunlap, Glen Mary, Parsons Beauty, Buster, Howard No. 41, Portia (Seedling) and Valeria.

The last mentioned seedlings, especially Portia, are of exceptional merit. The large, uniform, bright, firm fruit borne very uprightly on strong stems are some of the features of the variety, along with its ability to yield over a very long season, with fruit of good quality to the last pick.

Propagation.—Currant cuttings of several of the best varieties were made and planted out in nursery rows, to have them ready for distribution.

The cuttings did not take as well as desired, but there are quite a lot of very good young bushes on hand.

Caragana, Honeysuckle, Lilac and Japanese Quince, were started from seed.

VEGETABLE GARDEN

This branch of the work involved the expenditure of considerable time, especially in connection with the hotbed work.

In connection with the cultural and variety test work, very satisfactory results were obtained.

The following cultural experiments were carried on:—

Thinning of beets, carrots, parsnips and onions; successive crop tests with peas and beans; training of tomatoes to stakes and wires; control of brown streak in potatoes and actual yield of one healthy tuber; yields from the planting of whole small potatoes, sets with one eye, two eyes and three eyes; control of the cabbage root maggot; different methods of celery blanching.

The testing of the different varieties of vegetables was carried on as usual. Cabbage, cauliflower, carrots, beets, onions, parsnips, salsify, tomatoes, peppers, peas, beans, radish, lettuce, spinach, kale, kohl rabi, melons, cucumbers, citron, corn, pumpkins and egg plants, were all under test, in addition to some of the seasoning herbs.

Garden beet, cabbage, parsnip, carrot, radish seed and Malcolm corn were grown this year, with quite good success. This seed is being kept for seed distribution.

ORNAMENTAL GROUNDS

The borders, both perennial and shrub, were very attractive this past season. All the hedges made splendid growth and were much admired by the numerous visitors. To make the space occupied by the hedges more attractive, grass was sown and long narrow flower beds cut between each of the hedge rows. One variety of perennial flowers was planted in each of these narrow beds. The effect was very pleasing.

It has been found that the early spring flowers attract very much attention, even the scant variety which we had last spring brought very many people to the garden. Tulips of the early doubles, singles, late singles, Darwins, daffodils and a few snowdrops comprised the collection.

In the annual flower garden there was quite a profusion of bloom from the middle of July until the frost came.

A small quantity of seed from some of the best perennial flowers was saved for distribution to people desirous of securing these varieties.

11 GEORGE V, A. 1921

SEED DISTRIBUTION

The distribution of garden seeds was limited to the minimum last spring; seed was sent only to those who made a special request to the office. During former years a notice was inserted in the local papers announcing the seed distribution. The demand was very great and the supply of seed barely met the demand.

It was discovered that the seed grown here gave very satisfactory results, and we feel that continuance of this distribution work would not attain the object sought, viz., the growing of garden seeds at home. Many of the people would feel that if it was possible to secure seed from the Station, there would be no need of growing seed at home. The general distribution was discontinued, therefore, on these grounds.

Potatoes.—Distribution of seed potatoes was conducted from this Station again last spring, and over five hundred three-pound bags were sent out. Four varieties were used, Irish Cobbler, Early Ohio, Green Mountain, and Rose of the North.

FIELD HUSBANDRY

Rotations.—Very little work has yet been taken up in this division outside of the regular field husbandry work of the Farm in general. The general rotation followed is a four years' rotation consisting of hoed crops the first year such as roots, potatoes and corn; second year, sown to grain and seeded with 10 pounds of clover and 10 pounds of timothy per acre; third year, two crops of clover, the second crop being used for seed purposes or put into the silo; fourth year, hay.

Crop Yields.—The crop of hay harvested the past season, amounting to 280 tons, was one of the best ever produced at this Station. The clover predominated very strongly in the first year's crop and gave a very good yield. The first cutting was commenced June 20 and a large amount of the second cutting was put into silos.

The cereal crop consisted of 60 acres of oats which yielded 46 bushels per acre. Two acres of wheat yielded 19 bushels per acre. Twenty-six acres were planted to Indian corn for silage. There was a mixture of sunflowers added to part of this crop which increased considerably the tonnage of the same.

FORAGE CROPS

Roots.—Twenty-two varieties of swedes were tested, Ewing's Conqueror Green Top giving the highest yield and Ewing's Universal the lowest yield.

Thirty-one varieties of mangels were tested, Steele Brigg's Giant Half Sugar Rose giving the highest yield and Steele Brigg's Prize Mammoth the lowest.

Thirteen varieties of silage corn were under test; the dent variety giving the highest yield was White Cap Yellow Dent with Wisconsin 7 next. Longfellow was first and North Dakota second in the flint varieties.

Sunflowers were also sown for silage purposes which gave a yield of 16 tons 1,461 pounds per acre. Japanese Millet yielded 12 tons 210 pounds per acre, and oats and vetches yielded 7 tons 388 pounds per acre.

FARM IMPROVEMENTS

Road Work.—The Farm road above the Ascot Consolidated School running from the northeast corner of the Station to the southeast corner has been completed. This road is used by the school vans to convey scholars from two districts to this Consolidated School which shortens the distance about two miles.

Four hundred and eighty loads of gravel were used to surface the roads running through the Farm. A light application of gravel is added every two years. These roads are dragged at different intervals throughout the summer months in order to

SESSIONAL PAPER No. 16

keep them in good condition. The drag is one of the best road making machines if used often and at the proper time after a rain.

Fences.—Three hundred and fifty rods of wire fencing was erected the past season, also two hundred and twenty-five rods of rail fencing.

Drainage.—Thirty-two thousand five hundred feet of tile was laid during the summer of 1919 as follows: 15,000 feet of 3-inch, 8,000 feet of 4-inch, and 9,500 feet of 6-inch tile.

There was also one hundred rods of open ditch dug.

Clearing Land.—Seven acres of new land was stumped and rocks taken out and field ploughed, which will be an acquisition to the cultivated area.

Buildings.—There was built the past season a sheep barn 30 by 75 feet with a side addition for feed room and lambing pens 16 by 16 feet. This building is divided into five pens with yard run for each pen. This has added much to the convenience of handling our flock.

There was also built one permanent poultry house 16 by 32 feet for the accommodation of 100 hens and also three colony houses. Other necessary repairs were done on other buildings.

MEETINGS

There was held on the 14th of August the fifth annual Farmers' Day gathering at this Station which was very well attended by people from all parts of the district who took much interest in the different lines of work, such as live stock, field husbandry, horticulture and poultry, etc., Addresses were given by the Hon. Dr. Tolmie, Federal Minister of Agriculture; Dr. Grisdale, Deputy Minister of Agriculture; Mr. A. T. Charron, of the Provincial Department of Agriculture; Mr. Crepeau; Mr. Ritchie, Assistant to the Superintendent; Miss Chute, of the Domestic Science Branch of Macdonald College, and others.

Mr. T. F. Ritchie, Assistant to the Superintendent, and Mr. Lang, of the Poultry Division, held meetings throughout the winter months in different districts.

EXHIBITIONS

This Station had an exhibit at the Great Eastern Exhibition at Sherbrooke, occupying a space of 12 by 50 feet in which was arranged models of buildings, cereals, roots, seeds, sheaves of grain and grasses, vegetables and flowers. There was also an attractive poultry exhibit comprising day-old chicks, water fowls and equipment for poultry work. This exhibit was in charge of Mr. Ritchie, assistant Superintendent, Mr. Lang, of the Poultry Division, and Mr. Lemyre, of the Horticultural Division.

The Farm also had an exhibit at the Brome County Fair, which is a fair of three days' duration, and also at the Ste. Scholastique Fair in the county of Two Mountains.

VISITORS

We are pleased to say that the visitors at this Station show a marked increase from year to year and much interest is shown in the horticultural, poultry and live stock work.

EXPERIMENTAL STATION, LA FERME, QUE.

REPORT OF THE FOREMAN-MANAGER, PASCAL FORTIER, B.S.A.

THE SEASON

April of 1919, although rather cold, was very pleasant and the warmth of the following month favoured seeding operations. Rain fell in sufficient quantity to permit of a uniform germination. However, the drouth of June injured all crops and rain in July, August, and September made harvesting operations and fall ploughing and seeding difficult. From October, 1919, to April, 1920, the weather was comparatively favourable for this district. It is interesting to note that during 1919 there was no frost from June 28 to September 10, but just before the former date severe frosts completely destroyed the Indian corn and beans and damaged the potatoes. It is altogether probable that the late spring frosts and early winter frosts will become less frequent as the land is more and more cleared.

METEOROLOGICAL RECORD, 1919-20

Month	Temperature F.			Precipitation			Sunshine hours
	Mean	Highest	Lowest	Rainfall	Snowfall	Total	
	°	°	°	Inches	Inches	Inches	
April.....	28.86	68	-13	2.16	8.00	2.96	
May.....	49	89	17	3.62		3.62	
June....	65.15	94	27	1.43		1.43	308.2
July.....	65.5	94	34	4.14		4.14	241.9
August.....	59.2	83	40	5.67		5.67	137.1
September.....	48.3	72	30	5.15		5.15	90.7
October....	35.12	63	14	2.96		2.96	45.8
November....	21.1	44	-23	1.69	6.00	2.29	
December.....	-0.47	27	-40		39.00	3.9	
1920							
January....	-9.62	26	-48		19	1.9	
February...	3.79	27	-41				
March.....	15.74	58	-29				

LIVE STOCK

Horses.—There are at present on hand ten heavy work horses and two light drivers. The work horses have been employed in clearing and general farm work. For feed they have cost an average of 67 cents per day per head, the high cost being due to the fact that considerable roughage had to be purchased from distant points.

Cattle.—On March 31 the herd was made up of three grade Ayrshire cows, one grade Holstein cow, one Ayrshire bull, 3 grade Ayrshire calves and one grade Holstein calf. From the first of April, 1919, to March 31, 1920, the milch cows gave 30,468 pounds of milk and cost \$664.92 for feed. The milk yielded a revenue of \$2.18 per hundred pounds and the cows cost 31 cents per head per day. No experimental work has yet been carried on with the dairy cattle.

Swine.—On March 31 there were on hand four sows, one boar and 32 swine of different ages, the latter being fattened for sale. The breed kept is the Yorkshire. During the year careful figures of the cost of fattening 12 pigs bought October 26, 1918, were kept. On April 10, 1919, they weighed 970 pounds and on the 9th of

SESSIONAL PAPER No. 16

August, 1,873 pounds, or a gain of 903 pounds in all, or 75 pounds per head. On the last-named date they had cost for feed \$279.69 and they were sold at 15 cents per pound. This return is very satisfactory when one remembers the high cost of feeds and the rather unsatisfactory temporary quarters in which they were kept. It is hoped to build a modern piggery in the course of the year 1920.

HORTICULTURE

The season was very good for garden crops, with the exception of corn, tomatoes and beans, which were injured by frost early in June. Very good crops were gathered of peas, lettuce, cabbage and carrots.

The growth of the apple trees was considerably kept back by the frosts of spring. The raspberries and strawberries were also damaged by frost. Gooseberries gave good results.

Flowers bloomed very freely; until the end of September one might see flowers in bloom which are generally confined to the milder regions. These included dahlia, phlox and China asters. With the exception of the maples, which were winter killed, the elms, poplar, oak and ash trees sent here by the Central Experimental Farm and by the Quebec Department of Agriculture grew very well in the nursery.

FARM IMPROVEMENTS

A boarding house large enough to accommodate 35 men and with all necessary conveniences was built during the year. Two cottages were also put up, one for the assistant to the superintendent and the other for the farm foreman. These buildings will be a great assistance in obtaining the necessary supply of farm labour. Part of the old barn built by the Militia Department was remodelled into a stable. A considerable amount of road-work was done and it is hoped next year a road will be finished from the Station to the railway station. About two miles of fencing was put up and a considerable amount of stone removed and surface drainage done. Plans were also prepared for the underdrainage of the Farm, which it is hoped be taken up next year.

EXPERIMENTAL STATION, KAPUSKASING, ONTARIO**REPORT OF THE FOREMAN-MANAGER, SMITH BALLANTYNE**

WEATHER CONDITIONS

The spring of 1919 opened very early and was more favourable for work on the land than any spring since the opening of this Station. Seeding was commenced May 17, and extreme heat, and light rains following seeding were responsible for a quick germination of all seeds. The growth was very rapid during the first part of June, but owing to a severe and lengthy spell of drought during the latter part of June and during the month of July serious damage was done to crops, especially to the root crop.

During the months of August, September and October heavy rains did considerable damage to crops, and greatly retarded the progress of harvesting and fall ploughing.

Winter weather set in early in November and during the months of December, January, February and March very low temperatures with heavy snowfalls were recorded.

FIELD HUSBANDRY

Both spring and fall wheat did remarkably well despite adverse weather conditions; fall wheat harvested July 26 yielded thirty bushels per acre.

Four varieties of spring wheat were sown, Marquis, Prelude, Huron and Ruby, all of which matured. Ruby wheat matured in sixty-nine days and threshed twenty-six bushels per acre. The other varieties matured, but as they were much later than Ruby wheat they were spoiled in the stook by wet weather during the latter part of August.

Potatoes, mangels, turnips, corn and sunflowers made a remarkable showing, the yield from potatoes, turnips and sunflowers being exceptionally good.

Great damage was done to the mangel crop by cut-worms. From a two-acre plot of mangels, one-quarter alone was harvested, the remainder being entirely destroyed by cut-worms.

The hay crop on the average was a light one, but of excellent quality and it was harvested in first-class condition.

A good crop of second-growth clover was harvested which was stored in the silo for ensilage.

Fall wheat sown in the fall of 1919 looked in good condition when winter set in, yet, owing to heavy winds during the winter the snow did not cover this crop as well as wished for, and quite a large area will be winter-killed.

METEOROLOGICAL RECORDS

Months	Temperature Fahrenheit.				Precipitation			Sunshine
	Maximum		Minimum		Rainfall	Snowfall	Total	
1919	Date	Degrees.	Date	Degrees.	Inches	Inches	Inches	Hours
April.....	21	65	1	-12	2.54	5.00	3.04	169.4
May.....	28	90	9	20	2.04	1.00	2.14	255.6
June.....	18	92	28	30	0.23	.....	0.23	317.2
July.....	19	92	7	33	4.08	.....	4.08	235.6
August.....	20	84	8	36	8.00	.....	8.00	152.0
September.....	3	85	26	28	10.06	.....	10.06	95.6
October.....	5	70	27	12	4.00	3.00	4.30	67.9
November.....	11	47	19	4	.....	20.00	2.00	43.8
December.....	23	35	18	-40	.....	16.00	1.60	74.9
1920								
January.....	7	30	24	-52	.....	6.50	0.65	No record
February.....	8	31	27	-38	.....	2.00	0.20	113.8
March.....	23	62	14	-39	1.00	7.00	1.70	144.6
Totals.....					31.95	60.50	38.00	1,670.4

HORTICULTURE

In the main the results from the different branches of this department were highly satisfactory, small fruits and vegetables as well as all classes of flowers and shrubs made an excellent showing.

Tomatoes, pumpkin, squash, peas and beans were successfully grown in the open, fine yields being obtained from each variety mentioned.

Currants, raspberries and strawberries did well, the results from all being satisfactory.

A start was made in connection with the planting of hedges around the superintendent's residence, and the completion of this work will be carried on during the coming summer.

SESSIONAL PAPER No. 16

BEES

Two colonies were supplied this Station from the Central Experimental Farm, Ottawa, in September, 1919, which were kept in the open until October 20. On this date they were transferred to winter quarters in the cellar of the superintendent's house. The winter being very severe great difficulty was found in keeping an even temperature in the room provided for the bees, which resulted in the loss of a considerable number. However, both colonies seem to be strong, and a good result is expected from them during the coming season, as this section of the country seems to be well suited for bee-keeping. This branch is considered important in a new country such as this, as the working of bees will without doubt greatly assist plant life and the growing of clovers.

ANIMAL HUSBANDRY

Horses.—Sixteen horses of heavy draught type are kept at this Station. During the winter months these horses are employed for the most part in hauling of logs and pulpwood taken from land clearing operations, as well as keeping the Station supplied with firewood.

By working the teams alternately it is found that they keep in good condition and are in first-class condition for spring work which at this Station is very hard on horses owing to the amount of new land that is being worked. The breaking of virgin soil by team-power calls for both strength and endurance in horseflesh.

Dairy Herd.—The dairy herd at this Station at the present time numbers thirty head made up as follows: Four mature grade Holstein cows, eight mature grade Ayrshire cows, three two-year-old Ayrshire heifers, eight yearling Ayrshire heifers, and six Ayrshire calves. Springbank King Theodore 2nd heads the herd.

As the above herd increases in number it is the intention of the management to weed out and build up a district herd of Ayrshire cattle, selecting the stock from the best producers as shown by the records of performance and production that are being kept.

Beef Cattle.—Thirty-four head of Shorthorn stock comprise this herd, nineteen grade Shorthorn cows and fourteen calves with ages ranging from three to ten months.

Kentville Marconi, a registered Shorthorn bull received from Experimental Station, Kentville, N.S., heads this herd.

All Shorthorn calves are allowed to run with their mothers, and at present we have a bunch of calves from which we hope to establish an excellent type of beef cattle.

Sheep.—A pure-bred flock of Shropshire sheep is kept at this Station, the foundation flock being supplied by the Central Experimental Farm, Ottawa.

Results during the year ending March 31, 1920, were not satisfactory, as out of a total of nineteen lambs dropped from twelve ewes, seven lambs only were saved. The lambs when dropped were weak and a large percentage affected with goitre. Lack of proper housing, as well as insufficient exercise were responsible for these conditions. During the month of July, 1919, the flock was attacked by dogs, and three fine ewes and four lambs were killed.

During the winter of 1920 different methods of feeding and exercising were used, as well as providing better shelter. The result during the present spring is highly satisfactory, eighteen lambs of the finest type being dropped by eight ewes.

The ram lambs will be sold to settlers in this district during the coming fall months. The settlers have manifested great interest in sheep.

Swine.—Nine registered Yorkshire sows and one registered Yorkshire boar comprise this herd.

11 GEORGE V, A. 1921

Five young sows supplied by the Central Experimental Farm, Ottawa, were bred for the first time at this Station, and farrowed in May, 1919. Seventy-one young swine was the result and of this number fifty-two were successfully raised.

Four young sows were kept from the above litter for breeding purposes; these together with the five mature sows are expected to farrow during the coming summer.

A ready market is found for all young pigs, the settlers of this district being anxious to procure good stock.

IMPROVEMENTS

Land Clearing.—One hundred and four acres were cleared of standing timber during the past winter, from which 559,374 cords of pulpwood, 12,264 feet of Balm of Gilead, 4,159 feet of spruce, and 75,789 feet of poplar were taken, all of which was marketed at a profit over and above all expenses. This work provided employment both for men and teams during the winter months, as well as clearing a valuable tract of farm land.

Roads.—One mile of new road was graded during the year, this work being done for the most part by a machine grader.

Breaking New Land.—Eighty acres of new land were summer-fallowed, fifty acres of which were sown in fall wheat.

Considerable difficulty has been experienced here in getting a plough suitable for this work. Several different makes have been tried. During the fall of 1919 a 16-inch Manitoba brush-breaker plough with forecarriage was used, this plough gave excellent satisfaction. The forecarriage attachment overcomes the difficulty experienced with ordinary ploughs when ploughing mossy land.

Drainage.—During the summer of 1919, 3,837 feet of open drains and 10,393 feet of tile drain were dug. This drainage was done in order to drain a number of wet areas on the farm property and thus enable the areas drained to be earlier cultivated.

During the winter a Buckeye traction ditcher was purchased, and the drainage of this Station's property will be conducted on a larger scale during the coming season.

NEW BUILDINGS

Farm Boarding House.—The foundation for this building was put in during the fall of 1918, the building being completed in 1919. This building is first-class in every respect and provides excellent accommodation for farm help.

Implement Shed.—This building was constructed during the summer and fall of 1919, and proves a valuable acquisition to the Station. The ground floor of this building is used for storing implements and machines, as well as affording ample room for a blacksmith shop and tool-room. The upper floor is used for a carpenter shop, store room for grain, feed grinding, etc.

Dairy Building.—A combined dairy and ice-house was constructed, which is being equipped with a power churn and separator. A 10-horsepower boiler has been installed which will furnish heat for the building and steam for sterilizing purposes.

Root House.—This building was constructed late in the fall of 1919. The main part of this building is underground. Cedar planks placed perpendicularly were used in the construction of the walls. The roof also was made of cedar and covered with straw and earth.

Painting.—All farm buildings including those constructed during the year were thoroughly painted, which added much to the general appearance of the Station's property.

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, MORDEN, MAN.**REPORT OF THE SUPERINTENDENT, E. M. STRAIGHT, B.S.A.****THE SEASON**

The winter of 1918 and 1919 was exceedingly mild, and the snow not deep at any time. In fact the precipitation, including snow, amounted only to a few inches. The fields were practically bare all winter, and the temperatures much above normal, except for a few brief periods.

The spring, however, was not early. What snow there was remained until late season, and then the snowfall was the equal of any storm during the winter. Early working of the land at the Experimental Station was out of the question, for the soil remained cold and sodden. During May the weather improved, but there was still some snowfall. There were no terrific gales such as were experienced in former years, and therefore, the damage from soil blowing, so destructive in this country, was not great during 1919.

As the season advanced the heat became intense but fluctuations of temperature were not so great as noted the season before. Even the nights were warm, so that tropical plants, such as melons, did well in the open and ripened before killing frost. Southern Manitoba last season might almost be regarded as being in the corn belt, for many varieties planted late, matured in good time. The heat continued throughout the season no killing frosts being recorded until the 29th of September. Shortly after this we went directly into winter. There was no autumn. The result all through southern Manitoba was disastrous to many farmers. Potatoes remained undug, and such root crops as were grown in the province in many cases remained in the ground. Blizzards were frequent in October and November, and the mercury dropped below zero on many occasions, and as low as seventeen below in November. Practically all of the crops at the Experimental Station were harvested, but under some difficulty. A few turnips and mangels remained in the ground.

The winter of 1920 was severe and constant. Even at the end of our fiscal year, March 31, the winter lingered. The snowfall was particularly heavy. Despite this, the ground was frozen to a great depth.

From casual observation it would seem that considerable damage had been done our young trees in the orchard and nursery. Since one block of orchard trees, seven feet or thereabouts, was absolutely covered, root and branch by snow, the effect of this winter covering will be observed with interest, as well as the effect of the added moisture from the melting snow.

METEOROLOGICAL RECORDS

Month	Temperature		Precipitation	
	Maximum	Minimum	Rainfall	Snowfall
1919	°	°	Inches	Inches
April.....	71	17.5	0.2	6
May.....	99.5	20	1.90	
June.....	90	31	5.92	
July.....	97.5	46	3.95	
August.....	99.5	37.5	2.12	
September.....	86	28	2.03	
October.....	81	zero	0.115	11½
November.....	47	-19		13
December.....	40	-27		3½
January.....	31	-34		17¾
February.....	34.5	-27		9
March.....	50	-17	0.09	14½
Total.....			15.515	74½

LIVE STOCK

Horses.—The horses at the Experimental Station, Morden, at present numbering eight, consist of seven work-horses and one driver. Of the work-horses, five are mares and two are geldings. A four-horse team of the heavier type is used for field work such as ploughing, seeding, etc., while the other three, which are of a lighter draught, are kept for work in the garden and orchards.

All the horses have been kept in excellent working condition throughout the season. Only feeds which have been grown on the Farm have been fed. These feeds consist of whole oats, oat sheaves, and a mixture of western rye grass, timothy and clover. On such feeds the horses at the Station have thrived, worked practically every day, withstood the extreme heat of the past season, and are entering the winter in splendid condition. An outstanding point of interest so far as our horses are concerned has been the well groomed, thrifty condition in which they have been kept throughout the season.

Little in the past has been done in an experimental way with horses at this Station. We are, however, undertaking feeding experiments to ascertain the most profitable way of wintering idle and work horses.

Cattle.—Two Ayrshire cows were purchased in November, 1919, having in mind the making of them the foundation of our future dairy herd. These cows have never been entered in the Record of Performance so that it is difficult to say what may be done with them, but we have great hope that they may prove themselves worthy. Beauty of Elm View No. 32281, sired by Sir Oliver, bred by Donald Cummings, Lancaster, Ont., and Greenbank Lottie 2nd No. 29996, sired by Barcheskie King's Own (Imp.), bred by William Hay, Howick, Que. Mr. Norbury, from whom the cows were purchased, has already seen the influence of these cows in the improved stock in his own town and in the surrounding country.

Steers.—Thirty steers were purchased in the fall of 1918, and sold at the end of a period of one hundred and eighty-two days. Fourteen were kept in an open outside shed, and sixteen were kept inside divided into two pens. The object of our work was to determine the effect of an excess feeding of roots in early season, as well as to compare outside and inside feeding. The results of the experiment during this year and past years would show that inside feeding has every advantage in a province like Manitoba. Those fed outside suffer much from the cold under the open conditions which obtain at the Experimental Station. It is possible that where barn room is not available, some profit may be found in outside feeding, but our observations would lead us to think that much of their food is used up in keeping the animals warm. The less expensive plant, necessary for outside feeding, may offset in some measure the lesser gain which is constant with the years.

	Pen 1 inside	Pen 2 inside	Pen 3 outside
	\$	\$	\$
Average cost per steer.....	89.22	89.22	89.22
Average cost feed per steer.....	46.08	45.9	41.76
Average selling price per steer.....	184.12	168.92	177.31
Average profit per steer.....	48.82	33.8	40.61

Pen 1 was fed an excess amount of roots in the early season. It was something of a surprise when we found that the eight steers so fed had gained six hundred pounds between December 4 and January 1. This was decidedly better than either of the other two, and besides that, the condition into which the animals were put to receive the concentrates, was noteworthy, for they maintained their gain until

the end of the feeding period. Our work with steers has shown that steers can be fed with profit, and that they can be put on the market in a finished condition. This finishing, despite the extra work, was found always necessary with experimental feeding.

Some attempt was made to put lambs on the market at Easter. Six were sold on April 14. They weighed 380 pounds, and sold at twenty-four cents per pound. It will be noted that these lambs brought at that time over \$15 each, on an average: one brought over \$20. The lambs were born in the latter part of January and February, and show conclusively that winter lambs, where at all possible, pay as at no other time. The present flock consists of 82, and the total sales from the flock during the year has amounted to \$1,031.56. This has been made up of wool, lambs and cull sheep, the latter being replaced by our better lambs.

[illegible]

16-10

11 GEORGE V, A. 1921

POULTRY

No poultry has been kept at the Station so far, but we hope to make the poultry industry one of our leading lines. We believe that poultry can be made a profitable industry in Manitoba. Certainly there is no line of work which needs to be emphasized more than how to obtain eggs in winter. With the advent of winter, hens cease to lay, and the purchase of fresh eggs becomes impossible. Such conditions are not necessary or profitable. Poultry work fits into the general scheme of orcharding which is one of our leading lines at the Station.

BEES

No bees are kept at the Farm at present, but this has been owing to the fact that there was no place where they might be wintered. An attempt to winter outdoors was not successful, owing to the severe winters. For the coming years the basement of the Superintendent's house will be available for the purpose, which we believe would be an admirable place for their winter keep. We hope to purchase a number of colonies during the coming season. The effect of the honey bee in the orchard and garden is always noticeable, and especially so in Manitoba.

FIELD HUSBANDRY

The sixty-acre wheat field of the year before was seeded to western rye grass, timothy and clover. The ten acres seeded to timothy and clover was a most excellent crop for this country, despite the fact that these crops have not done well in the Morden district. The yield from this part of the field was about two and one-half tons to the acre, while the western rye grass yielded not more than two tons. However, the entire field was an excellent crop for the season, providing more hay than we could feed on the Farm.

A block of the western rye grass was cut with the binder and threshed. The yield of seed per acre, which was sold at \$14 per one hundred pounds, gave us considerably more dollars per acre than the hay was worth. Besides that the hay had considerable value as such. From the thirteen and one-half acres so handled 5,700 pounds of clean seed were secured. This was sold at 14 cents per pound, making a total return of \$798, or \$59.11 to the acre. If the thirteen and one-half acres had been cut for hay, as was the rest of the field, and sold as such, it would have returned \$540, or \$40 to the acre, the hay selling at \$20 per ton. Saving this thirteen and one-half acres for seed, however, resulted in a gain of \$19.11 per acre over the hay, and the straw in addition made valuable feed.

No special machinery was used in any way in handling the western rye grass for seed. It was threshed with the Sawyer-Massey separator by slowing down the machine, feeding slowly, and allowing the grain to come out of the grain auger shaft instead of allowing it to be elevated. In cleaning the seed the ordinary grain fanning-mill was used without any special sieves.

The oat and barley crop with us was rather a poor one. The oats did fairly well, and furnished us with sufficient oats for feeding, but the barley crop was almost a failure. The fifteen acres of corn did well, and was harvested much before killing frosts. The corn at that time was quite ready for the silo. Another forty-acre field was in summer-fallow, and on this our corn will be planted next year.

A large number of varieties of corn were planted, and records taken on same. Owing to backward season these test plots were not planted so early as we should have liked, but the season later on was favourable for the ripening of corn. The Northwestern Dent fully matured, while Yellow Flint, Longfellow and North Dakota got beyond the glazed stage before frost. The Northwestern Dent is a corn having great

SESSIONAL PAPER No. 16

possibilities in this country. We propose next year undertaking some experimental work with the crossing of this corn with the so-called Squaw corn of the Northwest. This Squaw corn will keep on growing even though the nights are cold. There is some hope that this corn combined with the Northwestern Dent might be the solution of the corn problem for Manitoba.

About twenty acres of potatoes were grown at the Farm, but further mention of this will be made under Horticulture.

About one acre was planted to sunflowers to be used for ensilage. These were of the Mammoth Russian variety, and made excellent growth. They were carefully planted by hand in rows 2 feet apart, $2\frac{1}{2}$ feet, 3 feet, and 4 feet, and thinned so that the stalks would stand about one foot apart in the row. The results of our experiment would indicate that they should not be planted closer than three feet apart. With rows closer than three feet much difficulty was experienced in cultivating the crop, and in harvesting same. The yield per acre with rows three feet apart seemed slightly greater than four, but from the whole plot it was fully double that of corn.

Since we have only one silo on the Farm, definite experimental work from the feeding standpoint is not easy. The sunflowers, however, were put in the silo with corn above and below, so that we should be able to determine in some measure the relative feeding value of the sunflowers.

All of our sunflowers at the Farm were more or less rusted last year. Probably twenty-five per cent of the leaves dried up before the harvest. It was also noticed that the closer the sunflowers were planted, the more rust was present, but the rust was found on all plots. The season previous to this, large quantities of sunflowers were planted for protection between our experimental vegetable plots, and even though they stood separate and apart from other rows of sunflowers, they suffered much from the rust. In fact some stalks broke down and were absolutely unfit for any purpose by the beginning of August. We believe that if the sunflower is to be used extensively as an ensilage crop in the West something must be done to control the rust. No doubt Bordeaux mixture would be of value, but from the standpoint of this crop the use of the mixture would never be practical.

HORTICULTURE

The entire area given to the horticultural department at the Experimental Station, consisting of about ninety acres, was occupied with horticultural crops in the season of 1919. It is true that some of these, such as potatoes and beans, might be regarded as field crops, yet they were planted and cared for by the horticultural department.

The soil for the most part is of a much heavier type than such crops demand, yet when properly cared for yields well in the normal season. Naturally this soil is especially rich in nitrogen, and of an alkaline nature, so that in seasons of heavy rainfall all crops take on a very succulent and leafy growth, not easily restrained. In the dry season, however, the reverse is noticeable. Crops on these soils are not the first to suffer, but in time of protracted drought the soil becomes absolutely dry, and growth ceases. This was especially noticeable in our potato fields during the present season. Though not diseased they died before they had nearly completed their growth.

The entire area has been especially weedy, not so much from so-called pernicious weeds of this province as from French weed. This French weed is particularly troublesome, and hard to get rid of. In fact it has given the writer as much concern as any weed with which he has had to do. Though an annual, the seeds, which have germinated in the autumn, live throughout the winter, and are quite ready in early spring to ripen a fresh crop of seeds before the usual spring cultivations. This makes the fight against French weed constant throughout the season. Though still abundant in many fields on the Farm, some progress is being made towards its extermination.

11 GEORGE V, A. 1921

A considerable area of the horticultural department is still a bare prairie, yet some planting has been done. So far as the young orchards are concerned Caragana hedges and laurel-leaved willows have been planted—miles of these in fact—and though small for the most part, are growing with the trees, and providing some shelter. The willow hedges planted at the start in 1916 are growing rapidly and providing much shelter.

Large Fruits.—The orchard work was again extended during the season of 1919. About fifteen hundred trees were set in such a way as to connect up the blocks set in former years. This necessitated the removal of the old nursery, and the care of much larger plantations. The orchard will not be greatly extended but the work will consist of the replacement of such trees as die. The orchard is now taking on permanent form and though the hedges are decidedly small, the trees which are either seedlings or one-year grafted stuff, will receive considerable protection from the snow and rape.

During the season of 1919 one block was set using a white spruce as every second tree and each alternate row was so arranged that no two apple trees or evergreens would be opposite each other. The idea of this work was to determine the effect of the evergreens on the apple trees, chiefly from the standpoint of protection.

Another block was set, using four trees in place of one, with the trunks of these trees about three feet from each other. These trees will be grown in the bush form, with the hope that the four trees, branching from the ground, will furnish mutual protection to each other. All of this is in the experimental stage, and may or may not succeed. The greater part of this nursery material set in 1919 lived, and though the growth throughout the season was not great, yet with a favourable season, we expect them to do well. It has been noticed that trees coming from Ottawa not only start off better, but continue to grow better than those propagated in the West. We believe that the seasons in the West are so severe that the wood is injured in such a way that the young tree is not able to recover. Young trees obtained this past season from Portage, though looking well at the time of planting, had black hearts, and continued in a dead or dying condition throughout the season.

It has also been noticed that the trees growing on the south side of a hedge do not do so well as those growing on the north side. We believe that the future will show that the northern exposure for the apple orchard in this province is more suited to our conditions than the southern. If it is possible to retard the growth of the buds in the spring until fine weather becomes constant, then the tree has every prospect of developing normally. On the other hand, if the buds are forced by the heat on the south side of the hedge, there is great danger that they will perish during the next cold night.

A few plum trees, butternuts, pears, etc., obtained from various sources for experimental purposes, have been tried out. What future there may be for this material remains to be seen.

It was of great interest to the writer during the past season to note the few trees which were coming into bearing for the first time. These were crab-apples and some of the first and second crosses between standard apples and the Siberian crab.

A few plum trees bore one or more fruits of sufficient quality to warrant propagation. The Mammoth plum, although not an experiment with us, promises to do well on our Farm, and we are planting it in fairly large quantities. This Mammoth plum would do credit to orchards much farther east. Our seedlings of the Cheney plum are especially promising, and though they have not borne with us, many of them have blossomed, and should bear during the coming season. This seedling plum hedge is a rapid grower, and a thing of beauty. There is every prospect that among these seedling plums many will be sterile, but from examination we would conclude that many others should bear fruit.

SESSIONAL PAPER No. 16

Small Fruits.—The small fruit plantations have been again extended, and the raspberry was offered for sale in some quantity during the past season. Three varieties of raspberries continue to do well, namely, the Sunbeam, the Herbert and Minnetonka. These varieties suit our purpose better than others, and the future commercial planting on the Station Farm will be from these, unless something else is found in the meantime better than those we now have. Many of the commercial varieties in the East have no value in the West. The Cuthbert, for example, is not only killed at the tips, but dies, root and branch, during our most severe winters. The future for the raspberry in Manitoba is bright. The canes of all varieties should be turned down and covered with soil during many winters, and we recommend that it be done every year. The red spider is particularly troublesome during some of our hot and dry summers, but it is the only serious pest attacking the raspberry.

The red currant is also a small fruit of promise. Many varieties are hardy and yield well. For the past season we have had much difficulty with the currant fruit worm. This insect has been especially active all over the prairie. No effective means of control has been discovered. During the season of greatest attack the fruit falls rapidly, and a promising crop may be destroyed in a few days.

The gooseberry has not done well with us, and we do not expect it to do so. As the gooseberry is a cool weather crop, the high temperatures and dry conditions of Manitoba are not conducive to its best growth. The attack of aphids is also especially troublesome on gooseberries at certain seasons and continued attacks kill the plant in one or two seasons. Some of our oldest specimens have been killed outright, and others are dying. The currant has never produced at this Station in quantity sufficient to pay for the trouble of growing it. The black currants grow well enough, but bear little fruit. For this berry, however, there is practically no demand.

A few of our strawberries get through the winter, but many varieties fail outright. We are attempting to extend our strawberry plantations, and are doing so as rapidly as we can secure the plants. The North Dakota—a cross between the Jesse and the Manitoba Wild—shows great tenacity, both in producing runners during the dry season, and in persisting during our hard winters. The fruit is not large, but the quality is most excellent. We also believe that the Senator Dunlap will eventually win out as a commercial sort on the prairie. The everbearing varieties have possibilities in the home garden, but are not heavy enough bearers to make them a paying proposition from the commercial standpoint. The everbearing sorts, however, are making many friends among the prairie farmers, for the unusual experience of picking strawberries in late season, right up to the frost and snow period, never fails to please.

Vegetables.—Considerable attention has been given to the vegetable work at the Farm. A garden of large area was planted in the spring of 1919. This included all of the standard vegetables and many others planted wholly for experimental purposes. For the most part these vegetables did well. Something more than a half-acre of onions was planted, and found ready sale at the Farm. These onions were practically all that were grown in the Morden district. The tomatoes ripened their fruit in early season, and in sufficient quantity to meet all demands. The cucumbers outdid themselves throughout the whole district. The quantity was so great that there was no demand. The melons were especially fine and an abundant crop. Southern Manitoba, with the promise of a season such as we had last year, might produce melons for export. Melons are grown by the Mennonite farmers throughout the whole of the reserve. This year the supply was greater than the demand.

The twenty acres of potatoes planted at the Farm did not yield as they did during the previous season. This large area was planted to two sorts, namely, the Irish Cobbler and the Early Ohio. These varieties are two which we constantly advocate as being well suited to the province. It is a noteworthy fact that in our test plots, although much below what we had expected, the Cobbler was a leader last summer. During a season of normal rainfall such results would not be possible, for the later

11 GEORGE V, A. 1921

varieties continue to grow, but during a season such as this, the early maturing potatoes are the best yielders. The Green Mountain, a later variety, has much promise in the southern part of the province, and we are hoping to develop a strain early enough to suit our conditions. The quality of this variety is especially good. In fact the greater number of varieties this year are very fine.

About fifteen acres were planted to peas and beans during the year, but the yield from all was very much less than that of one year ago. All sorts of beans ripened in good season, however, so that there was not the same difficulty at time of harvest as formerly.

Only the earliest varieties of tomatoes are of much use in this province during the ordinary season. The Alacrity is one of the best that we have tried out, although not the heaviest bearer during the past season. Burbanks Early yielded 105 pounds 12 ounces, while the Alacrity A yielded 78 pounds 2 ounces, and Alacrity B, 36 pounds 8 ounces. The Earliana is perhaps the most popular variety on the prairie. Many of the standard sorts do not get beyond the green fruit stage. The Danish Export is another variety which has done well with us, but the fruit is small.

The Alacrity A was planted in larger quantities than any other variety, so that it was possible to attempt some experimental work from the cultural standpoint. One plot was pruned and tied to stakes and kept thoroughly away from the ground throughout the year, while another plot was permitted to grow without training. Experimental work carried on by the writer in the East with the Earliana, along the same line, would indicate that nothing was gained either in earliness, quality or yield by such staking and tying, but in Manitoba last season with the Alacrity A the reverse was proven. It will be noticed that the rows which were staked yielded 629 pounds as compared with 344 pounds from the rows which were not staked. Frankly speaking, these weights were a surprise as we expected a contrary result. It only emphasizes the fact that results obtained in one part of the country may or may not be true in another.

Flowers.—All of the standard annuals were tried, but the season was much less favourable for this work than formerly. Many varieties failed to germinate at all. Others remained in the ground all summer, and germinated only in the autumn. The California poppy, sweet alyssum, ten weeks' stock, phlox, verbena and calendula are among the best for prairie planting.

The bulbs do well in Manitoba. Owing to war conditions no tulips were planted, but these usually do well in the Morden districts. Gladioli made a good showing, and were planted in quantity. These bulbs, when gathered and stored this autumn were even superior to those planted last spring, and promise well for next year.

Many varieties of the hardy roses were planted, and were quite productive of bloom during the first season. No doubt many of these will not persist during the winter, but we hope that some will prove themselves hardy enough for this district.

The Canterbury Bell is another flower which has been greatly improved during the past few years, and we believe is quite hardy.

The great future for the prairie garden is with the perennial. The season is far too short for most annuals. The plant is scarcely well established before killed by frost, but the perennial not only makes rapid growth in the spring, but persists well on in the season. We hope to propagate the perennials in large quantities during succeeding years.

FARM IMPROVEMENTS

Buildings have not been pushed at the Experimental Station to the extent that they would have been, had the times been normal. So many buildings are necessary for the successful prosecution of the work that it has been difficult to know what should be asked for first.

SESSIONAL PAPER No. 16

The Superintendent's house was undertaken in rather late season for Manitoba, but is at present near completion. This is a frame structure on cement foundation, and presents a rather pleasing appearance. When the painting, which we are now planning to do during the coming season is done, the place will, we think, have a very homelike appearance.

A new horticultural shed was erected in the fall, and was found to be of much use while harvesting the horticultural products. Later in the season it was used as a storehouse for farm implements. An extension was also put on our sheep-house to permit the storage of feed.

We were also fortunate in obtaining an abundance of water in another field, which we hope to use for pasture next year. We have been very fortunate in obtaining water on this Farm. The well in question is only fifteen feet deep, but furnishes an abundance of water for all purposes. On an adjoining farm, after many attempts, the effort to obtain water has been given up. Many wells have, however, been dug on this farm several hundred feet deep, but without water.

The silo and implement shed constructed the summer before continue to be satisfactory. The Farm buildings are being painted a colonial yellow with a dark green trimming. We are following this colour scheme on all new buildings, and expect to make the old buildings conform to this scheme as soon as possible.

Roadmaking.—The back approach to the Farm has been gravelled for the entire distance and greatly improved. The permanent roadways to the Farm have not yet been laid out. It has been our intention to extend the main street of Morden village to the station and through our grounds. This was rendered impossible heretofore, owing to the fact that certain land, not belonging to the Farm, must needs be crossed. At the present writing we have been informed that the land has been purchased so that much attention will be given to the roads and drives next year.

Fences.—All fences on the Farm are in first-class condition. We have used woven wire and cedar posts, with a strand of barbed wire on top. This fence is practically all that could be desired. When the new field referred to above is taken over, no doubt changes in fences and the construction of others will need to be made.

EXCURSIONS AND VISITORS

The Annual Convention of the Great Plains Official Horticultural Association held one session in Morden, and the members spent some time in going over the Station. The Horticultural Society of Morden and Harmony Orchestra entertained the visitors at a banquet on the Farm. In conjunction with this all of the townspeople and others were invited to the Farm for a picnic. The weather was unfavourable, but a fair number spent the afternoon with us. Several demonstrations were put on, such as poultry culling, buttermaking, canning and judging of live stock. The sports were cancelled for the most part owing to the bad weather.

More interest was shown in our work during the past summer than before, if this interest may be judged by the number of visitors coming to the Station. These visitors have come from some distance. During the vegetable season visitors were so numerous for the purchase of vegetables, fruit, etc., that it was impossible to care for them at times. The revenue receipts for vegetables sold during the month of October was somewhat greater than \$1,800.

The Superintendent spoke on our work at the Station at the Farmers' Week in Winnipeg, at the Convention held at the Farm and several times in the churches of Morden. The purchase of a motor car has made it possible for the Superintendent to visit some of the farmers in surrounding districts. The standing crop competition was carefully gone over. He was able also to assist the county agent and Extension Department in the judging of horticultural products at several exhibitions.

EXHIBITIONS

An exhibit was put on at a number of the fairs in southern Manitoba. Mr. E. S. Hayter, the assistant at the Station, was in charge of this work. We exhibited at Carman, Miami, Melita, Souris and Cartwright. An exhibit of horticultural products was shown at the Horticultural Fair at Morden, and though not as large as we had shown in the past, it was attractive and the products of good quality. The work has been widening out with the years, and we hope before long to be fully equipped and outstanding as an Experimental Station.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILICAN, B.S.A.

The crop season of 1919 started with a heavy rain the first week of April. This gave a good supply of moisture but delayed the work on the land. Farm operations began about April 20. Favourable weather for seeding prevailed from then on and the crop was sown in good time. A dry spell from early May till June 12 gave early crops somewhat of a setback and caused poor germination of roots and corn. Good rains fell during the middle and latter part of June which made crop prospects improve greatly and insured a good first cutting of alfalfa. The month of July was dry and exceptionally hot so that ripening was very rapid and the grain as a result did not fill very well. Rust made its appearance and did considerable damage in the district, though the Experimental Farm crop escaped with slight injury on account of its earliness. Harvesting and threshing were completed early. The hot weather in July and August was favourable to the development of corn and the quality of the corn was the best in many years, being loaded with fine ears. A considerable quantity of ripe seed was harvested.

METEOROLOGICAL RECORDS FOR BRANDON, 1919-20

—	Temperature F.			Precipitation				Total sunshine
	Mean	Highest	Lowest	Rainfall	Snowfall	Total	Heaviest in 24 hours	
1919	°	°	°	Inches	Inches	Inches	Inches	Hours
April.....	37.07	70	10.8	1.43	1	1.53	1.12	173.5
May.....	55.7	95.7	11	1.60	.....	1.60	0.45	247.1
June.....	65.2	89.5	29	3.57	.....	3.57	1.34	228.7
July.....	66.8	95	41	2.14	.....	2.14	1.05	283.4
August.....	64.8	98	33	1.38	.....	1.38	0.71	250.6
September.....	52.7	85.5	24.4	1.62	.....	1.62	0.95	114.4
October.....	29.7	72	-11	0.72	12	0.84	0.72	145.9
November.....	12.8	42	-27.1	.....	8	0.80	0.60	109.4
December.....	-5.2	38	-35	.....	5	0.50	0.20	114.9
1920								
January.....	-6.9	30	-40	.....	17	1.70	0.80	88.3
February.....	3.0	33.7	-31	.....	3	0.30	.....	117.5
March.....	14.1	45	-24	.....	11	1.10	0.50	132.5
Total for year.....				12.46	57	17.08	.....	2,000.2
Average for 10 years.....				12.08	42.85	16.33	.....	1,962.3
Total for 6 growing months, April to September.....				11.74	1	11.84	.....	1,297.7
Average of 10 years for 6 growing months, April to September.....				13.15	5.7	13.72	.....	1,251.3

SESSIONAL PAPER No. 16

LIVE STOCK

Horses.—There are twenty-five horses on the Farm on March 31, 1920. Four of these are pure-bred Clydesdale mares and one grade Clydesdale brood mare. There are two pure-bred fillies rising two years old and three last year's colts, two of which are pure-bred. There are three driving and general-purpose horses and the remaining number, heavy working geldings, complete the list. Five mares were bred this year and four are in foal.

Cattle: Dual Purpose Shorthorn.—The breeding herd of sixty-one head is composed of two pure-bred Shorthorn bulls of dual purpose breeding, thirty milking cows, twenty-seven heifers and calves of pure-bred dual-purpose Shorthorn breeding and two grade cows of the same type. The best milk record completed during the year was 11,074 pounds of milk, testing 4.3 per cent butter-fat. Several other good yearly records were made and the herd as a whole made a good average for Shorthorns. A considerable number of bull calves of milking strain were sold to farmers in Manitoba and many more could have been sold had they been available.

Steer Feeding.—An experimental feeding test was conducted with two-year-old steers. Fourteen steers were fed and were divided in two lots. The object of the experiment was to determine the value of recleaned elevator screenings, now graded as "Standard Stock Food," as a feed for fattening cattle. One lot of steers was fed on these screenings, ground and mixed with bran, in the proportion of two and one-half per cent of screenings to one per cent of bran. The other lot was fed on oat chop. The coarse fodder in both cases was identical. The lot fed on screenings and bran made an average gain of 2.13 pounds per steer per day, and those fed on oat chop made a gain of 1.42 pounds per day. The cost of one hundred pounds of gain with screenings and bran was \$17.63, while with oats it was \$29.21.

It is probably too much to suppose that the screenings and bran are as much better than oats as these results would indicate, but it is at least reasonable to conclude that they are very satisfactory and valuable feed for steer feeding.

Sheep.—There are seventy-two head of sheep on the Farm, consisting of three pure-bred Oxford Down rams, one pure-bred Shropshire ram, one pure-bred Suffolk ram, eleven pure-bred Oxford Down ewes and the remainder, grade ewes.

The grade ewes are high grade Oxford Downs. An experiment is being conducted comparing the use of Oxford Down, Shropshire and Suffolk rams for breeding on these ewes. Last year was the first of this experiment. The lambs sired by the Suffolk ram were the best, the progeny of the Oxford ram came second and the lambs sired by the Shropshire ram were the poorest. It is believed, however, that the results are traceable probably more to the individuality of the rams than to the breed. The test is being continued.

Swine.—The swine on hand on March 31, exclusive of young litters, are two Berkshire boars and seven sows and one Yorkshire boar and eleven sows. During the year over two hundred young pigs were raised and marketed. Some of the best were sold to farmers for breeding and the remainder marketed for pork.

Experiments in pig pastures were continued and the results were corroborative of previous experiments, viz., that rape is the best annual crop for pig pasture and that oats, barley and rye are also very suitable, that ripe peas or squaw corn for hogging down do not give satisfactory returns.

Experiments in feeding recleaned elevator screenings to pigs were continued with results which confirmed previous results that this feed is fully equal to barley for fattening pigs.

POULTRY

The Barred Rock and White Wyandotte breeds are kept. All pullets are trap-nested and some excellent egg records have been made. Breeding is conducted with the object of increasing the utility of the fowl. A house for one hundred hens was built which illustrates the best points of poultry house construction as determined by experimental work in previous years.

The first Manitoba Egg-laying Contest was started on November 1, 1919. Ten colony houses were built to house this contest. Entries were received from Manitoba breeders and the following breeds are represented in the contest: Barred Rock, Partridge Rock, White Wyandotte, Silver-laced Wyandotte, Buff Orpington, Rhode Island Red, White Leghorn, Brown Leghorn, Ancona and Campine.

FIELD HUSBANDRY

Rotations.—The following rotations have been under test at this Farm for a number of years:—

“D,” four years’ duration (wheat, wheat manured, oats, summerfallow). This is purely a grain-growing rotation, except that manure is applied every four years.

“E,” four years’ duration (wheat, wheat, oats, summer-fallow): This is exactly the same as “D,” except that no manure is applied, and is a typical grain-growing rotation.

“F,” five years’ duration (wheat, wheat, corn or roots, oats or barley, clover hay): This is a mixed farming rotation suited to conditions where it is desired to grow both a large amount of wheat and a large amount of fodder for stock.

“G,” six years’ duration (wheat, wheat, oats or barley, clover hay, pasture, corn or roots): This is also a mixed farming rotation and allows for pasture for stock as well as cropped land.

“H,” six years’ duration (wheat, wheat, summer-fallow, oats, hay, pasture): This rotation provides both grain crops and hay crops, but omits hoed crop.

“I,” six years’ duration (flax, oats, summer-fallow, wheat, hay, pasture): This rotation is of similar character to “H,” but substitutes flax for one of the wheat crops.

“Q,” eight years’ duration (roots and peas, wheat or oats, hay, hay, pasture, pasture, green feed and rape): The land used in this rotation is light and gravelly and is therefore used as a sheep farm.

“W,” ten years’ duration (wheat, wheat, corn or roots, oats, barley, alfalfa, alfalfa, alfalfa, alfalfa, alfalfa): This rotation is adapted to a dairy or pure-bred stock farm where the chief object of crop growing is the production of a large quantity of good fodder.

The table which follows shows the average cost per acre of operating these rotations, including rent, use of machinery, and all the cost of handling the land and producing the crop (but not marketing). It also shows the average return per acre, and the resultant profit. These figures are based on normal pre-war prices; if present prices were used, much larger returns and profits would be shown.

Rotation	Cost per acre of operation. Average of 5 years	Returns per acre. Average of 5 years	Profit per acre. Average of 5 years
	\$ cts.	\$ cts.	\$ cts.
“D”.....	10 19	11 99	1 80
“E”.....	8 50	10 73	2 23
“F”.....	11 93	15 98	4 05
“G”.....	11 38	17 14	5 76
“H”.....	8 89	12 22	3 33
“I”.....	9 10	13 76	4 66
“Q”.....	7 17	7 26	0 09
“W”.....	10 38	15 85	5 47

SESSIONAL PAPER No. 16

Cultural Experiments.—Deep ploughing is giving rather better results than shallow, though the figures obtained are not as conclusive as would be expected.

One ploughing of summer-fallow is giving equally as good results as two and means less work.

The substitution of a pasture crop for bare fallow has reduced the following wheat crop. June ploughing of summer-fallow has proven much better than July.

In seeding down grasses, better results have been obtained where seeding has followed corn or summer-fallow, than where grain was the previous crop, and the larger the number of preceding grain crops, the greater the difficulty in getting a good catch.

Better catches are obtained without a nurse crop than with one, but not enough better to pay for the loss of the grain crop.

In breaking up sod of tame grasses and clovers, best results have been obtained by breaking in July immediately after removing the hay crop and working as a summer-fallow during the remainder of the season.

In the application of barnyard manure on stubble land for growing wheat, oats or barley, best results have been obtained with all three grain crops by applying in the fall and ploughing in. The same result was also obtained in manuring for corn.

The substitution of grain crops ploughed in for green manure, instead of bare summer-fallow, resulted in a decrease in yield. Where the green crops were ploughed in early in July the yield was practically the same as on summer-fallow land, but later ploughed green manured land wasted too much moisture.

The results of a very extensive system of experiments with soil packers have shown no advantage from the use of packer on this soil.

CEREALS

In the variety tests of wheat, Marquis has again demonstrated its superiority by producing the largest yield of all varieties tested. Ruby was second highest and matured three days earlier than Marquis. In the tests with oats, Victory gave the best results for 1919 and Banner the best for a five-year average. Among varieties of barley the O.A.C. No. 21 variety gave the largest yield for 1919, but Manchurian did the best on the five-year average with O.A.C. No. 21 coming second. Tests of varieties of peas, rye and flax were also made.

FORAGE CROPS

Alfalfa gives the best results among perennial hay crops and western rye grass is the most satisfactory of the grasses. Sweet clover gives a heavy yield the first year after sowing but being a biennial dies down after that. Millet gave the largest yield of annual hay crops in 1919 but usually green oat hay gives the best return.

Corn was a fairly good crop in regard to yield and unusually good in regard to maturity. A considerable quantity of good seed was secured. Longfellow gave the largest yield but is rather too late for this district in any ordinary season. Northwestern Dent is about the most satisfactory in the average season, and Minnesota No. 13 is also recommended.

A large number of varieties and strains of mangels and turnips were tested, the results of which are available. The Yellow Intermediate type of mangel gives good results and is easy to handle.

HORTICULTURE

A large number of varieties of vegetables have been grown for test and the results are available for the use of correspondents or visitors. Cultural experiments have

11 GEORGE V, A. 1921

also been conducted, especially with potatoes and tomatoes. Unusual success has been attained in the ripening of tomatoes. A large number of annual and perennial flowers are grown for test and demonstration. The trees and shrubs continue to be a demonstration of the possibilities of the country. Work with fruit is being continued.

BUILDINGS

A cottage for the gardener was erected. A one-hundred-hen poultry house was built and ten colony houses for the egg-laying contest.

EXHIBITIONS, EXCURSIONS, VISITORS, ETC.

Exhibits were made at the Manitoba Winter Fair and the Provincial Exhibition at Brandon in July. Prizes were won on live stock, including grand champion Yorkshire boar and grand champion Clydesdale mare.

"Farmer's Day" at the Farm, July 8, 1919, was poorly attended on account of bad weather. Many small parties and thousands of individual visitors inspected the Farm during the year.

The Superintendent gave an address on "Winter Housing of Swine" at the Annual Convention of the Western Canada Live Stock Union at Victoria, B.C. He also gave one on "The Ventilation of Farm Buildings" at the Annual Meeting of the Live Stock Association of Manitoba in Brandon. Agricultural meetings were addressed at several points in Manitoba and some work done in judging live stock and field crops at agricultural fairs.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, N. D. MACKENZIE, B.S.A.

THE SEASON

The season of 1919 was abnormal in many respects. Seeding commenced on the 19th of April and was general by the 21st. At the end of May the crops were very promising. A period of hot weather, high winds and drought followed which cut down the yield of all crops considerably. The fall was very open until October 1, when a very heavy frost was experienced and winter set in almost immediately without any break in the cold weather. Grains were a fair crop but forage crops of all kinds were very light. The potato crop generally was badly hit by the early freeze-up.

METEOROLOGICAL REPORT, 1919-20

—	Temperature					Rainfall		Snowfall		Total sunshine
	Maximum		Minimum		Mean					
	Date	°	Date	°	°	Days	Inches	Days	Inches	Hours
January.....	24	40	2	—34	14.67	.....	.....	5	12.25	53
February.....	10	38	26	—48	— 1.68	.....	.....	5	13	106.
March.....	18	40	2	—33	10.09	.....	.....	4	10.25	129.
April.....	28	69	23	17	40.13	4	0.87	1	3.50	163
May.....	28	93	4	22	54.09	5	1.39	.....	.....	241.
June.....	27	96	1	35	65.96	9	2.81	.....	.....	293.
July.....	16	94	26	40	65.84	6	2.68	.....	.....	311.
August.....	18	95	26	38	65.06	5	1.89	.....	.....	267.
September....	12	89	27	22	53	5	0.93	1	1	138.
October.....	7	73	25	—22	26.35	1	0.69	3	7.50	118.
November.....	16	44	30	—24	11.40	.....	.....	4	11.25	66.
December....	19	40	10	—34	3.48	.....	.....	3	4	50.
Total.....	.....	.....	.....	.....	.....	35	11.26	26	62.75	1,942.

SESSIONAL PAPER No. 16

LIVE STOCK

Horses.—There are thirty horses on the Farm and of these sixteen are pure-bred Clydesdales and the remainder are work-horses and grade colts. Three pure-bred foals were raised during the year and two of them are very promising.

The cost of feeding a horse which is worked the entire year was found to be \$180 at present prices of feed. The cost of feeding a colt from weaning to three years was \$159.35.

Cattle—Shorthorns.—The herd numbers seventy-two, consisting of three stock bulls, eight bull calves and sixty-one females. Of these, six females and one bull were purchased at the Dryden-Miller sale of Imported Shorthorns and by careful selection it should be possible to build up a very high-class herd. Care will be taken, however, to retain the good milking qualities which the herd already possesses.

There is a very good market for all our surplus stock at good prices.

An experiment was conducted during the winter to determine the feeding value of sunflower silage for milch cows as compared with corn silage. The results obtained show that the palatability and feeding value of the sunflower silage are fully equal to those of corn, the only limiting factor being the very stimulating effect the sunflower silage had on the kidneys.

The cost of feeding a cow during the lactation period has been found to vary from \$79.93 to \$134.74, depending on her milk production. The cost of raising a calf to one year was \$70.35; from one to two years the cost was \$42.50.

Grade Cattle.—Twenty steers were purchased for experimental feeding in the fall of 1919. They were divided into two equal lots and used to compare the feeding value of recleaned screenings (Standard Stock Feed) as compared with barley as the main ration for finishing steers. The barley showed superior gains and a lower cost per pound gain. The steers on barley made an average daily gain of 1.68 pounds at a cost of 17.02 cents per pound and the ones fed on screenings made an average daily gain of 1.37 pounds at a cost of 18.79 cents per pound gain.

Sheep.—At present there is a flock of one hundred and eleven sheep, of which number, thirty-nine are pure-bred Shropshires and the remainder grades, with the exception of a pure-bred Oxford ram.

The grading up experiment has been continued using Shropshire and Oxford rams on range ewes, and the results have been uniformly good, the second and third cross ewes closely resembling pure-breds in type, and the weight of wool being increased from five and one-half to ten pounds per ewe.

The cost of feeding a ewe for one year was found to be \$9.93, and of raising a lamb from weaning to two years was \$13.92.

Swine.—The swine herd is twenty-four in number and consists of one Yorkshire boar and ten sows, one Berkshire boar and two sows and ten feeders.

Owing to the peculiarities of the season the pasture experiments with swine were a failure and no results were obtained. The cost of maintaining a sow for one year was found to be \$28.34 and for raising a young sow from weaning to one year was \$23.59.

POULTRY

Two breeds of poultry are kept on the Farm, namely, Barred Plymouth Rocks and White Wyandottes. Special attention has been paid to egg production and utility type, all birds being trap-nested. The average egg production of the birds retained in the breeding flock was 172 eggs in one year. The value of these eggs at prevailing prices was \$6.04 and the feed cost \$2.30, leaving a profit per bird of \$3.74.

The demand for hatching eggs and breeding stock was far greater than our supply and a number of new houses were built to enable us to increase considerably the size of the flock so as to keep pace with the demand.

A laying contest was commenced during the year, twenty pens being entered by various breeders in the province. The birds will be trap-nested throughout the year and all birds laying over one hundred and fifty eggs recorded in the Record of Performance for poultry. Some of the pens are laying very well.

FIELD HUSBANDRY

Rotations.—Four rotations have been under test at this Farm for a number of years as follows:—

(C) Three-year rotation (wheat, wheat, summer-fallow). This is purely a grain growing rotation such as is generally practised, with slight variations, throughout the province.

(J) Six years' duration (summer-fallow, wheat, wheat, oats seeded down, hay, pasture). This is a mixed farming rotation but does not include a hoed crop.

(P) Eight years' duration (summer-fallow, wheat, wheat, summer-fallow, corn, barley seeded down, hay, pasture). This is a mixed farming rotation with oats not included in the crops grown.

(R) Nine years' duration (summer-fallow, corn, wheat, oats, summer-fallow, wheat, oats seeded down, hay, pasture). This also is a mixed farming rotation with barley not included in the crops grown.

The following facts should be noted in connection with these rotations:—

The land in rotation (C) is becoming infested with weeds and it seems impossible to cope with them in such a rotation.

Rotation (J) is practically a failure on account of the seeding down being done so far from summer-fallow, the result being that a good stand of hay is only secured in very wet years.

Both (R) and (P) are fairly satisfactory, the land being fairly free from weeds and good crops are obtained.

The following table shows the cost per acre of operating these rotations during the past year, including rent and use of machinery. The returns per acre and profit are also shown, all figures being based on present day prices.

Rotation	Cost of operating per acre	Returns per acre	Profit per acre
C.. .. .	\$18 52	\$28 57	\$10 05
J.. .. .	18 53	19 87	1 34
P.. .. .	20 98	62 09	11 11
R.. .. .	24 47	40 15	15 68

Cultural Experiments.—Fairly deep ploughing is giving the best results. The benefits are particularly noticeable in the stubble crop.

Summer-fallows should be ploughed early and fairly deep. Two ploughings are not necessary but fall cultivation previous to fallowing increases the yield slightly.

Fall ploughing of stubble gives best results for wheat and fall cultivation and spring ploughing for oats.

In order to secure a catch of grass it is necessary to seed down on land that has been recently summer-fallowed.

In breaking up sod of cultivated grasses and clovers best results are obtained by ploughing immediately after removing the hay crop and working as a summer-fallow the remainder of the season.

The ploughing under of green crops for manure has not given as high yields as bare fallow.

SESSIONAL PAPER No. 16

A good seed bed increases the yield materially.

Very little difference was noted in the value of the various types of packers.

Seeding at various depths has not shown any definite results.

Applications of commercial fertilizers have not increased the yield sufficiently to repay the cost.

CEREALS

Variety test work with cereals has been continued. Marquis wheat continues to be the highest yielding variety. Leader was the heaviest yielding oat on fallow, followed closely by Victory and O. A. C. No. 72, both of which latter varieties outyielded it on stubble. The two-rowed varieties of barley were the heaviest yielders, Duckbill and Danish Chevalier being the highest. Of the six-rowed varieties O.A.C. No. 21 and Manchurian were best. Variety tests of peas, rye, and flax were also conducted.

FORAGE CROPS

Corn was a fairly good crop of excellent quality. The long season enabled a quantity of seed to be saved. Taking into consideration quality and yield, North West Dent was the best variety. Roots were only a fair crop. Extensive tests were carried on to compare the trueness to type as well as yield of seed from different sources. Again this year the hay mixtures containing alfalfa demonstrated the value of this plant by the comparatively high yield procured.

HORTICULTURE

Fruits.—A fair yield of all classes of fruits was obtained with the exception of gooseberries.

Vegetables.—Variety and cultural tests were continued in order to procure data on the most suitable varieties and methods for this part of Saskatchewan.

Flowers.—The past season was not a particularly favourable one for annual flowers, but perennials did well.

Trees.—Considerable winter-killing is noticeable among the evergreens, Scotch and Austrian pine and the Colorado blue spruce being damaged.

BUILDINGS

Twenty new colony houses for poultry were constructed during the year. Ten of these were used to house the Laying Contest and the remainder for housing our increased flock.

EXHIBITIONS

Exhibits of live stock and poultry were made at the Regina Summer and Winter Fairs, the Swift Current Poultry Show, and the Sinaluta Fair. At the Regina Summer Fair, the only show to which a competitive exhibit was sent, one of our Clydesdale mares was Canadian Bred Champion and another Reserve Grand Champion.

VISITORS

A large number of persons visited the Farm during the year, although, owing to the shortage of rolling-stock on the railways, it was impossible to arrange for special excursions.

EXPERIMENTAL FARM, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A

THE SEASON

The prominent feature of the season of 1919 was the light rainfall and its consequent results in soil drifting and light crops. There was the lowest precipitation for the five growing months of any year since records have been kept at the Station.

Following is the meteorological record for the year ending March 31, 1920:—

WEATHER OBSERVATIONS TAKEN AT ROSTHERN EXPERIMENTAL STATION

Month	Temperature F.			Total precipitation	Total sunshine
	Highest	Lowest	Mean		
1919	°	°	°	Inches	Hours
April.....	74.2	11.7	42.7	0.37	218.1
May.....	97.0	19.0	55.86	0.36	295.7
June.....	94.0	29.4	64.76	2.28	330.1
July.....	102.0	41.2	65.99	1.05	340.0
August.....	92.6	38.8	64.295	1.48	268.9
September.....	77.2	23.1	51.58	2.79	165.0
October.....	64.5	-11.8	26.33	0.55	102.1
November.....	43.3	-25.6	8.9	0.40	113.5
December.....	39.7	-36.1	1.62	0.20	108.0
1920					
January.....	31.8	-45.0	-7.0	1.20	102.5
February.....	39.7	-30.2	12.58	0.20	121.8
March.....	39.6	-28.0	12.84	0.85	189.9
Total.....				11.73	2,355.6
Average for years 1912-13-14-15-16-17-18.....				14.43	2,218.6
Total for five growing months, April to August, 1919.....				5.54	1,452.8
Average for five growing months, 1912-13-14-15-16-17-18-19.....				8.83	1,329.65

SOIL DRIFTING

Much damage was done throughout most of Saskatchewan with soil drifting in 1919 and some important lessons were gleaned from it at the Experimental Station. The same experience had been gone through in 1910, but to a lesser degree. In 1910 there was only one quarter-section occupied by the Experimental Station. It had been cropped almost continuously for the previous twelve years and was summer-fallowed in 1909. In 1910 it was practically the only land in the district which drifted, and it drifted so badly that no crop could gain a foothold till after a snow-storm in June. This quarter-section had been worked under several rotations for years 1911 to 1919, all of which included either grass or manure once in six years. In 1919 there was no drifting whatever on that quarter-section, whereas land all around that was in crop drifted far worse than any in 1910.

In 1914 there was added to the Experimental Station three quarter-sections which had been wholly devoted to grain growing for ten years previously. The land was weedy and from 1914 to 1919 was worked with the end in view of eradicating the weeds. There was no grass introduced nor manure applied to most of it. In 1919 any part of it that had not been manured or sown to grass within the past five years drifted badly.

SESSIONAL PAPER No. 16

There was one exception. A clump of trees covering about two acres stands at the south of the farm. The trees in this are approximately 30 feet high. To the northwest of this clump for a distance of approximately 1,500 feet there was no drifting and there was a crop.

It was not possible to grow a garden in 1910, but during the following years hedges were grown 200 feet apart east and west and 400 feet north and south. These had reached a height of 9 feet by 1919. In 1919 the garden was the best of any we have had.

Conclusions.—1. Heavy applications of manure once in four to six years tend to prevent soil drifting.

2. Seeding to grass once in six years and leaving in sod two years effectively prevents soil drifting.

3. A stand of trees protects the land in the direction towards which the wind is blowing for a distance of fifty feet for every foot in height of the clump of trees.

4. A garden is assured only when it is protected by efficient windbreaks.

LIVE STOCK

Horses.—The number of horses on the Station has been increased by three colts and decreased by one mare, which died. For beginning operations in 1920 there are sixteen work-horses and one driver, two two-year-old colts and three yearlings. The idle horses are fed night and morning and turned out in a field during the day all winter.

Cattle.—Owing to shortage of feed no steers were purchased for winter feeding. For the same reason the milk production from the dairy cattle was much below that of previous years. The cows were in as good condition as formerly but owing to lack of succulent feed in the shape of roots the milk production was greatly reduced.

All the cattle were affected during the summer of 1919 by a disease of the eye known as keratitis. A small, white, opaque swelling would appear on one of the eyes and within four to seven days cover the whole eye. Sometimes both eyes would be affected at the same time but usually the second would not be affected till the first was recovering. The eye was blind so long as it was covered by the swelling, which lasted from four to six weeks. In some cases a wash was applied twice daily made up of three grains of nitrate of silver to one ounce of soft water and one grain of sulphate of morphia. It was found, however, that all the cattle recovered completely in from six to eight weeks whether they were treated or not.

Sheep.—The start in sheep at the Rosthern Station was made in December, 1915, with the purchase of one hundred grade ewes and four Leicester rams. The proceeds of sales of wool, mutton and pelts each year following were as follows:—

Year	Wool	Mutton	Pelts	Total
1916..	\$ 250	\$ 459	\$ 60	\$ 769
1917..	600	455	146	1,201
1918..	593	551	106	1,250
1919..	675	610	154	1,439
Totals..	\$2,118	\$2,075	\$466	\$4,659

In December, 1919, we had the same number of sheep we began with and of a much superior grade.

The cost of feeding a sheep a year was as follows:—

Hay, 900 lb. at \$7 per ton.. . . .	\$3 15
Oats and barley, 118 lb. at \$2 per cwt.. . . .	2 25
Turnips, 360 lb. at 25 cents per cwt.. . . .	0 90
Pasture.. . . .	2 00
Total.. . . .	<u>\$8 30</u>

These prices for food are low for the present year but considerably above that of the past four year average. On most farms the pasturing of the sheep may be considered an asset which considerably reduces the cost of feed.

The greatest trouble we have had in connection with keeping sheep has been goitre in the new-born lambs. For two years the loss was as high as 20 per cent, but in 1919 and 1920 there have been no losses from this cause. To the present there is no satisfactory explanation of the cause of the disease.

Swine.—There were ten Berkshire sows and a boar held as foundation stock for the pigs of 1919 from which were raised to maturity 68. An attempt was made to compare values of different pastures with different grains as supplementary feeds, but the exceedingly dry season prevented any possibility of the pastures developing. A comparison was made between use of a self-feeder and hand feeding in which only about half the quantity was used in hand feeding. The pigs were on this experiment for 123 days and following are the results:—

	Ground feed consumed	Initial weight	Final weight	Gain pounds
Hand fed.. . . .	6,358 lb.	1,470 lb.	2,813 lb.	1,343
Self-feeder	14,286 "	1,420 "	3,962 "	2,542

There was almost twice the gain from slightly more than twice the feed. But the figures do not show all. When the two lots came to be fattened it was found that the self-feeder lot required little to put them in shape for market whereas the lot on limited rations required a great deal more time and feed. Nevertheless the lot on short rations were much superior to many pigs of the same age in the country, which goes to show that more liberal feeding of growing pigs in many cases would net the farmers much greater profit.

POULTRY

A beginning was made in poultry in 1919. A flock of 130 pullets was developed from eggs of a bred-to-lay strain of Barred Plymouth Rocks secured from the Experimental Farm at Indian Head. Six colony houses were built, each 8 feet by 12 feet, with cotton fronts. There were also built two permanent houses each 16 by 32 feet. It is expected that the houses will be filled from the progeny of last year's pullets.

FIELD HUSBANDRY

Owing to high winds and dry weather there were no hay yields and little grain yields in 1919. A field of sunflowers was cut off twice by drifting sand and some of it made a third start and came to maturity. The growth was so irregular that no fair estimate could be made of its yield. Part of a field of turnips was blown out completely and about three acres yielded a fair crop. All the experimental plots in grain, grasses and roots were ruined.

HORTICULTURE

Despite the adverse weather conditions the garden was the most satisfactory we have ever had. The soil was rich in humus having been heavily manured each year

SESSIONAL PAPER No. 16

for the past eight years, which gave it holding capacity for moisture. The hedges that were planted in 1912 afforded sufficient shelter to protect the plants from injurious effects of the winds, and the hot weather was conducive to early maturity. The foregoing applies to the vegetables and fruit gardens but not to the lawns nor flowers. The lawns comprise about two acres and were brown till the rains in late August. The flowers border the lawns on the south and east and of course were ruined by exposure to the north, north-west and west winds. Despite winds and drouth the shrubs and trees made normal growth except where they were planted in or near sod and in no season will they do well in this climate in the proximity of grass.

The greatest handicap to gardening in this province is the danger of late spring and early autumn frosts and there seems no sure way of overcoming the danger. All plants should be in the ground by the end of May for reasonable assurance of maturity and about one year in five the tender ones are caught by the June frosts.

Potatoes.—There were thirty-two varieties of potatoes tried in 1919 with a yield varying from 256 to 452 bushels per acre. Irish Cobbler, 382 bushels per acre, and Early Ohio, 308 bushels per acre, are the two varieties recommended for family use.

Potatoes is the only crop that has consistently given high yields every year during the past eleven years despite drought, hail, frost and winds, and yet throughout the north of Saskatchewan there are very few potatoes grown more than are sufficient to supply local requirements. The prices every year have been sufficient to give fair profits and in some years high profits. The cost of growing potatoes is low because there is no spraying to be done for either insect or disease and there are no stones in the soil to interfere with cultivation. It seems strange that larger areas are not devoted to potato culture.

EXPERIMENTAL STATION, SCOTT, SASK.**REPORT OF THE SUPERINTENDENT, M. J. TINLINE, B.S.A.****THE SEASON**

During the winter of 1918-19 the snow had covered the ground to a good depth and was uniformly distributed, consequently when the spring thaws came there was little run off and most of the water soaked into the soil providing ample moisture for germination of all early sown seed. The ploughed land was bare of snow by April 7 and seeding commenced on the 15th and was completed comparatively early.

May and June were unusually warm and dry and during the latter part of May and throughout the greater part of June wind-storms prevailed and soil drifting occurred in many districts doing considerable damage to grain crops. Twelve degrees of frost were registered on the morning of June 2; all tender vegetation was destroyed and grain crops were frozen to the ground. The dry weather continued throughout July and the first good rain of the season fell on August 10; as a result grain crops were light and matured early. Wheat harvesting commenced in late July. The rain caused a second growth in later grain crops, this was welcomed to help out the feed supply for stock. Potatoes, field roots, etc., made a wonderful growth after the rain and as killing frosts kept off until late September good crops were secured.

Winter set in early with a snowstorm on October 8, and by the 9th the ground was frozen too hard for ploughing. From October 21 to 24 there was a heavy fall of snow for this district and the weather continued unusually cold during November and December. During the first half of January and most of February milder weather prevailed, but winter continued up to the end of March.

11 GEORGE V, A. 1921

The long severe winter together with the scarcity of feed resulted in a loss of live stock on a number of farms.

METEOROLOGICAL RECORD, 1919-20

Month	Temperature F.			Precipitation				Total Sunshine
	Highest	Lowest	Mean	Rainfall	Snowfall	Total	Heaviest in 24 hours	
1919	°	°	°	Inches	Inches	Inches	Inches	Hours
April	72.0	8.5	41.99	0.79		0.79	0.20	206.9
May	92.5	18.8	53.38	0.88		0.88	0.40	285.1
June	97.0	20.2	62.08	0.91		0.91	0.41	333.8
July	99.8	36.7	64.65	0.75		0.75	0.23	328.0
August	90.3	40.0	62.9	2.56		2.56	1.11	267.6
September . .	79.0	19.9	52.2	1.56		1.56	0.60	162.6
October	69.0	-19.0	26.4	0.32	0.90	1.22	0.30	100.7
November . . .	44.5	-28.2	9.76		0.15	0.15	0.10	115.3
December . . .	40.0	-31.7	5.16		0.42	0.42	0.15	102.6
1920								
January	30.3	-41.0	- 3.5		1.30	1.30	0.50	100.7
February	35.7	-20.8	11.64		0.275	0.275	0.10	118.7
March	42.0	-26.0	14.6		1.35	1.35	0.30	135.3
Total for year				7.77	4.39	12.16		
Total for six growing months, April to September						7.45		
Average for nine years						13.30		
Average for nine years for six growing months April to September						10.23		

LIVE STOCK

Horses.—The fifteen horses on the Station have been increased by the addition of one grade Clydesdale filly foal from one of the mares and by the purchase of two pure-bred Percheron mares. The experimental work in determining the cost of horse labour and the cost of raising colts has been continued.

Cattle.—The experimental work with cattle has been restricted to winter fattening steers. The investigational work was conducted along three lines; first, with the object of determining the profitableness of this branch of farming; second, to determine the loss from dehorning just previous to putting in the feed lot and third, to ascertain the value of sunflower ensilage as a part of the ration. The average profit per steer over cost of feed amounted to \$19.25. It was found that dehorning caused the loss of 0.27 of a pound per animal per day for the entire fattening period. Steers fed 20 pounds of sunflower ensilage per day made an increased gain of 0.44 of a pound per animal per day over steers that had no ensilage. Sunflower ensilage proved to be worth \$13.81 per ton when added to ration of straw, roots and meal.

Sheep.—The past has been one of the most profitable years for sheep. The lamb crop averaged one and one-quarter lambs per ewe and the weight of fleece from the entire flock averaged 9½ pounds. Good prices were realized for the wool and sheep sold for mutton or for breeding purposes brought satisfactory returns.

The experiment in breeding ewe lambs conducted for three years has shown this practice unprofitable. Ewes bred when shearlings produced as many lambs in the one season as the others raised in the two years.

Swine.—Wintering swine in a large central building versus housing them in portable cabins has shown the latter method the more profitable. Only one crippled animal was noticed in the lots in the cabins, while quite a number of the young pigs from the same litters stiffened up when kept in the central building. Brood sows wintered in the cabins produced strong, healthy litters. In the fattening experiments

SESSIONAL PAPER No. 16

barley and oats were found to give better gains than standard screenings and oats, or shorts and oats.

The experiments with self-feeders indicate that where the man in charge of the swine is an expert feeder, as good gains can be made from the trough method of feeding as with the self-feeder, but where labour is scarce, or the feeder unskilled the self-feeder lots make the more profitable gains.

The question of supplying pasture for very young hogs, or for hogs that are being finished for market is a debatable one. Brood sows can be more economically fed if some pasture is used. But more experimental work with pasture will be necessary in order to determine the best kinds of pasture and the ages at which the swine make the most use of the pasture.

POULTRY

One permanent house for 100 birds was erected during the summer. The stock now consists of 224 birds, principally of the Barred Rock breed. A small flock of White Wyandottes was secured from Indian Head Experimental Farm, and two pens of Buff Orpingtons are kept. All the stock has been trap-nested. Out of a pen of 50 Barred Rock pullets, three laid over 200 eggs and 16 ran over the 150-egg record.

FIELD HUSBANDRY

Rotation of Crops.—No changes were made in the rotation work during the season of 1919. Records were kept of the cost of the operations conducted on the different fields and the return values therefrom. The investigational work in dates of seeding cereals and quantities of seed grain to use was continued. It was found that early seeding for wheat and oats was the most profitable, while for barley late April seeding gave the best returns. Barley appears to be more easily damaged by late spring frosts than the other grains. In the tests of quantities of seed, comparatively light seeding gave the best yields, one and one-half to two bushels of barley, one and one-half to two bushels of oats, and one to one and one-quarter bushels of wheat on summer-fallow gave heavier yields than lighter or heavier seeding.

Cultural Experiments.—In the cultural investigational work it has been found that the use of surface packers has given a small but consistent increase in yield over plots where either the subsurface or combination packers have been used. Providing the operation was timely, the use of the packer has given an increased yield. Packing after seeding has always proven profitable, while packing before seeding has only been beneficial where the seed bed was too loose. The most advantageous times to use the packers appear to be immediately after ploughing and immediately after sowing.

In the manuring experiments ploughing manure under has given superior yields to spreading the manure on the surface of the ploughed land.

In the stubble treatment experiments the snow held by the stubble during the winter appears to be of more value than is generally realized. Ploughing under, discing or burning stubble in the autumn has resulted in decreasing yields as compared with spring ploughing, spring burning, etc., particularly has this been noticeable during unusually dry years.

The seeding down experiments have given some useful data. Using a nurse crop in seeding down to grass has on an average decreased the yield one-half ton per acre. In the second cropping year the hay crop is usually dependent on the season's moisture and not on the method of seeding down providing a good stand has been secured.

CEREALS

The usual variety tests with cereals have again been conducted. For the most part later maturing sorts such as Red Fife wheat, Banner oats and Hannchen barley

11 GEORGE V, A. 1921

have given heavier yields than earlier maturing kinds. This is no doubt due to the crops not being so far advanced when the late summer rains came and consequently, being more benefited thereby. Of the newer varieties under test Liberty oats, Hannehen barley, Early White peas and Prolific spring rye give promise of proving useful. Novelty flax, a variety introduced by the Dominion Cerealists, has outyielded Premest. A field bean known as the Norwegian gave a medium crop of ripe beans.

HORTICULTURE

One mile of windbreaks was set out during the spring, the object being to determine in later years the influence of windbreaks on the yields of grain crops.

Fruit.—In the orchard Native Manitoba plums fruited for the first time. Bush fruits gave about one-half the average crop due to late spring frosts, while the strawberry crop was rather light owing to the drought.

Vegetables.—The season proved much more favourable for the production of vegetables than the preceding year. Beans and corn in particular yielded heavy crops. Potato yields were excellent but the tubers were unshapely owing to the rains coming late stimulating growth after the tubers were well advanced toward maturity.

FORAGE CROPS

The dry weather during the early part of the season resulted in the grass crops being light, while alfalfa grown in rows yielded at the rate of two tons of hay per acre. Oats and peas in two cuttings gave 2 tons 200 pounds. Sudan grass and Japanese millet were destroyed by frost on June 2 and were resown on June 3. The former gave less than one ton per acre and the latter one and three-quarter tons.

Splendid crops of turnips were harvested, while fair crops of corn and sunflowers were secured. It is interesting to note that sunflowers withstood 12 degrees of frost on June 2 with little injury and 3 degrees on September 2 only damaged some of the leaves on some plants.

EXHIBITIONS AND EXCURSIONS

An exhibit from the Experimental Station was staged at the summer fairs at Saskatoon, Macklin, Luseland, Plenty, Bounty, Alask, Kindersley and Zealandia.

The usual midsummer picnics and excursions were held and about 2,900 people visited the Station during the year.

BUILDINGS

The new buildings erected consisted of a one-hundred bird poultry house, a central building for swine, a silo, and cheap shelters for feeder cattle and sheep.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

THE SEASON

The crop season of 1919 was the driest ever experienced in the Lethbridge district since meteorological records have been kept or since farming has been attempted. The total precipitation from April 1 to July 3 was 3.84 inches. This would have been sufficient to produce at least some crop had there been any moisture stored in

SESSIONAL PAPER No. 16

the soil and subsoil from the year before, but the season of 1918 was also extremely dry so that every particle of available soil moisture appeared to be exhausted at the end of that growing season. In fact the rainfall during the summer of 1918 was so scanty that extremely little moisture was stored in the soil on well summer-fallowed fields so that even crops seeded on summer-fallowed land in 1919 started out with a serious handicap.

The first work on the land was done April 2. The last frost in the spring occurred on the morning of June 1, when the minimum temperature recorded was 31 degrees. The first frost in the fall was on the morning of September 26, when the temperature dropped to 32 degrees, and a killing frost occurred on the 29th.

Grain crops were seeded in good season and made a good start but the dry May followed by a warm June and July, when hot, dry winds were prevalent, made satisfactory growth impossible. All crops on dry land were a practical failure, even grain sown on summer-fallowed land in many cases did not develop sufficiently to make harvesting possible. On irrigated land all kinds of crops did well. The yields of alfalfa hay were particularly good not only on the Station but throughout the district. Service rendered by the Irrigation Company was very satisfactory and no serious shortage of water was felt by the farmers due to the company's main canals being silted up as was the case in 1918.

The precipitation for the last months of 1918, which would affect the amount of soil moisture at the beginning of the winter, was as follows:—

1918—September.....	1.07 inches
1918—October.....	0.24 inches
1918—November.....	0.43 inches
1918—December.....	0.46 inches
Total.....	2.20 inches

From the above it is quite apparent that the soil was very dry at the beginning of the calendar year of 1919.

METEOROLOGICAL DATA FOR CALENDAR YEAR 1919

Month	Temperature F.			Precipitation inches	Sunshine in hours
	Maximum	Minimum	Mean		
January.....	57.0	— 5.0	34.27	0.06	105.1
February.....	60.0	— 26.0	14.35	0.95	94.6
March.....	62.0	— 35.0	16.40	0.75	150.4
April.....	78.0	21.5	44.94	0.47	229.8
May.....	89.0	18.5	52.15	1.75	216.0
June.....	95.5	31.0	59.48	0.56	325.6
July.....	97.5	36.5	64.41	1.06	343.4
August.....	96.0	38.0	64.74	1.05	301.1
September.....	86.0	26.0	53.35	2.04	228.6
October.....	73.0	— 15.0	31.95	1.78	143.7
November.....	61.0	— 13.5	21.32	1.26	99.1
December.....	55.0	— 38.0	18.23	0.55	96.1
Total for year.....				12.28	2,333.5
Average for 18 years.....				15.618	
Total for four months of growing season, April 1st to August 1st, 1919.....				3.84	
Average for four months of growing season April 1st to August 1st for 18 years...				8.026	

LIVE STOCK

Horses.—At the present time there are twenty-two head of horses at the Station, made up of twelve work-horses and drivers and ten young horses, four of which are this year's foals. All the horses were wintered in a corral with an open shelter shed except the drivers and one draught team. Cost data were not kept on the feed

11 GEORGE V, A. 1921

consumed, but the horses wintered in the open came through in equally as good condition as did the stabled ones, and appeared to have as much heart, if not more, for the spring's work as did the ones that were housed. The saving in labour required in the feeding and care of those kept outside resulted in considerable economy.

Cattle.—For the first time for a number of winters no feeding tests with steers were carried on owing to the scarcity and high price of feed. Four milch cows are kept to supply milk to the employees on the Station.

Sheep.—A flock of ninety-eight grade Shropshire ewes were kept on the Farm during the summer and 132 lambs were reared. Cost data on the same were obtained. Five pure-bred Lincoln ewes and four pure-bred Rambouillet ewes are being used in cross-breeding experiments.

Early in October, 800 head of grade Merino ewes were purchased to carry out an experiment to determine the feasibility of alfalfa growers on irrigated land carrying fairly good-sized flocks of sheep on their farms and for summer pasture using the Forest Reserve in the Rocky mountains. Complete data in regard to cost of wintering these were kept and the coming summer's expenses will be obtained.

POULTRY

The results of experiments with poultry for the past year have been satisfactory. The Barred Plymouth Rock breed is the only one kept. The main object of the work carried on is to develop a better strain of layers and to distribute breeding stock from them amongst the farmers. Tests carried out indicated that April is the best month to hatch Plymouth Rock pullets for winter layers. Trap-nesting of all the pullet stock was continued. Out of one hundred and fifty hens thirty-eight produced over 200 eggs for the year and ninety of them produced over 150. In the spring of 1919 there were hatched 915 chicks. All the better cockerels were disposed of to farmers for breeding purposes and the demand as usual was greater than the supply. During the four winter months of 1919-20 the best pen of 55 pullets averaged over 70 eggs each, and several of them produced over 100 during this period. The cost of production was twenty-five cents per dozen with feed at prevailing prices. A Laying Contest was begun November 1 with eleven pens entered.

BEEES

The work carried on with bees during the past year was quite successful. Two colonies were wintered in a "dug-out" cellar and came out in excellent condition. Two 2-pound packages of bees from Alabama were received May 10. One of the wintered colonies and one of the purchased ones were used for division to increase the number of stands. The other two colonies were used for honey production, 407 pounds of extracted honey being obtained from the wintered one and 281 pounds from the colony made up from the 2-pound package of live bees. The two colonies used for division produced five strong colonies before winter set in besides yielding 152 pounds of extracted honey. The season's returns, confirming previous tests, indicate the excellent possibilities of profit in bee-keeping in the alfalfa growing districts in southern Alberta.

FIELD HUSBANDRY

As usual most of the field experiments were conducted in duplicate on the irrigated and non-irrigated parts of the Station. The comparative tests with the various rotations continue to furnish valuable information and data on the cost of production of field crops as well as to show the best arrangement of the crops. The following is a list of the rotations under test:—

SESSIONAL PAPER No. 16

Rotations Non-irrigated land.—Rotation "B," two years' duration, wheat, summer-fallow. Rotation "C," three years' duration, summer-fallow, wheat, coarse grain. Rotation "M," six years' duration, summer-fallow, wheat, coarse grain manured in fall, summer-fallow, peas and oats for hay, barley or oats. Rotation "S," nine years' duration, summer-fallow, manured for hoed crops, hoed crops, wheat, summer-fallow, wheat, coarse grains, summer-fallow, peas and oats for hay seed to fall rye, rye pasture. Rotation "T," ten years' duration, summer-fallow, wheat, oats or barley, seed to alfalfa, alfalfa hay or seed for two years, summer-fallow, hoed crop, wheat manured in fall.

Rotations on Irrigated land.—Rotation "U," ten years' duration, seeding alfalfa, alfalfa for five years, hoed crop, wheat, oats, barley. Rotation "V," alfalfa continuously.

The following table shows the average cost, the returns and profit per acre for the past seven years, of the various rotations. These values are all figured on normal pre-war prices so that the years are comparable. If the present return values were used the profit would be much greater notwithstanding the increased cost of labour.

Rotation	Duration	Average cost per acre 8 years	Average returns per acre 8 years	Average profit per acre 8 years
Non-irrigated land—	Years	\$	\$	\$
"B".....	2	7.46	11.14	3.68
"C".....	3	7.19	12.73	5.54
"M".....	6	9.59	13.27	3.68
"S".....	9	9.42	13.14	3.72
"T".....	10	9.43	17.85	8.42
Irrigated land—				
"U".....	10	17.30	63.75	46.45
"V".....	1	9.00	52.06	43.06

CEREALS

All cereals in the variety test plots on the non-irrigated land were a practical failure due to the drought. The straw was so short that they had to be cut with a mower and the yields were insignificant. Good results were obtained from the irrigated plots and compared favourably with past years. The highest yield of wheat was the "Pioneer," 52 bushels 30 pounds per acre; "Danish Island" oats gave 163 bushels 30 pounds per acre; "Bark's" barley gave 101 bushels 12 pounds per acre; "Golden Vine" peas gave 28 bushels per acre.

FORAGE CROPS

Although all classes of forage crops produced well on the irrigated part of the Station, those grown on the dry land made a practical failure in most cases.

Indian Corn.—Ten varieties were tested on irrigated land. "Longfellow" gave the best returns, yielding at the rate of 15½ tons of green feed per acre. On the dry land the corn did not grow high enough to make it worth while to harvest.

Roots.—Of the 22 varieties of turnips tested, the "Invicta" gave the best yield, which was 18 tons per acre on the irrigated land. All of the turnips suffered materially from attacks of aphides. No turnips were produced on the dry land. The best varieties of mangels yielded 30 tons and over per acre on the irrigated land but failed on the dry land. Sugar beets yielded at the rate of 15 tons per acre on irrigated land but failed on the dry land.

11 GEORGE V, A. 1921

Alfalfa.—The field lots of alfalfa on the irrigated land gave an average yield of between 4 and 5 tons of hay. On the dry land even the alfalfa grown in rows barely grew high enough to cut.

Pasture mixtures.—Interesting data are being collected as to the carrying of various mixtures for pasture. A mixture containing alfalfa gives greater returns than any we have tried without alfalfa. Another interesting point that has been demonstrated is that where there is a good turf of grass at the base, cattle and sheep appear to pasture on the alfalfa with no tendency to bloat.

Sunflowers.—Sunflowers made a particularly good showing and demonstrated the possibility of getting a large and satisfactory tonnage from this new forage plant.

HORTICULTURE

A fair quantity of crabapples was produced from some of Dr. Saunders' cross-bred varieties. A large number of plum trees bore fruit. These were all selected seedlings of the native plums of Manitoba. The vegetable garden on the irrigated land produced well but on the non-irrigated land the results were disappointing. All ornamental trees and shrubs wintered well.

IRRIGATION

Keen interest has been developed in irrigation throughout the southern part of the province due to the three very dry seasons just passed. The Superintendent, in consequence, attended many farmers' gatherings and addressed them on questions connected with irrigation.

DOMINION EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, B. C. MILNE, B.S.A.

THE SEASON

The average total precipitation at this Station for the twelve past years has been 17.575 inches. In 1919 a total precipitation of 16.683 inches was recorded, but the rainfall of 12.755 inches during the growing months was below the average. The first half of April was cool with light rain and snowfalls and work on the land did not start until the 19th of the month. Seeding operations were again delayed when snow fell May 2, and remained until the 10th. No damaging frosts were experienced during the growing season, but dry weather during the latter half of May, June, and July prevented the usual rank growth of straw. Very good yields of grain were obtained, those on the forty-acre fields of the main farm rotation being double what was obtained the previous year. Threshing operations were delayed by several rainfalls and scarcely a furrow was turned in many districts when winter set in October 20, 1919. Unfortunately a large number of bushels of potatoes were frozen in the ground throughout Central Alberta. All fall work at this Station was completed before the freeze-up, with the exception of about twelve acres of ploughing. The winter of 1919-20 will long be remembered for its steady severe temperatures and the scarcity and high prices of feeds.

SESSIONAL PAPER No. 16

METEOROLOGICAL RECORDS

Month	Temperature F.			Precipitation				Total Sunshine
	Mean	Highest	Lowest	Rainfall	Total Snowfall	Precipitation	Heaviest in 24 hrs.	
	°	"	°	Inches	Inches	Inches	Inches	Hours
January... ..	21.5	48.8	-4.6	.....	2.00	0.20	0.15	74.2
February... ..	12.69	46.8	-40.6	.....	8.18	0.818	0.40	100.7
March... ..	28.77	48.8	-38.1	.....	7.70	0.770	0.05	156.1
April... ..	42.86	72.3	21.4	2.30	.....	2.30	1.27	205.2
May... ..	48.08	88.9	12.4	2.14	1.0	3.14	1.2	231.0
June... ..	56.43	90.5	27.9	1.029	.....	1.029	1.85	284.9
July... ..	60.02	92.6	30.4	2.321	.....	2.321	0.745	259.0
August... ..	58.68	91.6	31.9	1.635	.....	1.635	0.40	245.0
September... ..	50.4	79.1	17.4	2.33	.....	2.33	1.53	188.0
October... ..	27.9	72.6	-10.6	0.64	.....	0.64	0.25	97.7
November... ..	14.7	54.2	-34.6	.....	11.8	1.18	0.8	102.1
December... ..	12.92	49.8	-38.5	.....	6.2	0.62	0.31	97.4
Total for year... ..				12.395	36.88	16.983	.....	2,041.3
Average for 12 years... ..				.....	.....	17.575	.....	2,146.4
Total for 6 months growing season, April to September, 1919... ..				.....	.....	12.755	.....	1,413.1
Average for 12 years for six growing months, April to September... ..				.....	.....	13.781	.....	1,452.9

LIVE STOCK

Horses.—The horses at this Station number 23 head. There are two pure-bred Percheron mares, four pure-bred and eight grade Clydesdale mares, and two pure-bred Hackney mares, besides seven grade geldings of Clydesdale and Hackney breeding. No foals were raised during the year. Twelve horses were wintered in the shelter of the brush at a cost of 21.5 cents per head per day.

Dairy Cattle.—There are now 36 pure-bred Holstein-Friesian cattle in the dairy herd. The young Holstein heifers are a very promising lot, having plenty of size, good constitution and evidence of good feeders and milkers.

In the grading-up test the improvement brought about by the use of a good bull of dairy breeding is very marked. This experiment is being continued as there are still some heifers in the test to freshen.

Milk from the dairy herd has been manufactured into Cheddar cheese and sold locally at 30 cents per pound.

The average lactation period of all cows which finished during the fiscal year was 328 days, while the average milk record for this year was 8,093.7 pounds. The average profit per cow for the year for her product made into cheese was \$98.12.

Beef Cattle.—There are now at this Station 47 pure-bred Aberdeen-Angus cattle, among which are a number of exceptionally good individuals. The herd is headed by a young bull, Eliminator of Gwenmawr 3, a strong well-bred animal and a good breeder. An eighteen months old grade steer won first in his class at the Calgary Winter Fair and was reserve champion of the show. There have been no losses from disease during the year, the entire herd having been vaccinated as a precaution against black-leg. Young bulls from the herd are being disposed of at reasonable prices to breeders as they reach suitable ages. Experiments conducted with beef cattle from which valuable data were collected are as follows: Green feed and hay versus silage and straw for beef cattle wintered outside; gains of young cattle on pasture; cost of raising beef bulls.

11 GEORGE V, A. 1921

Sheep.—Four hundred and eight common grade ewes were mated on December 12, 1918, and the following table gives the lambing results:—

Breed of Ram Used	Total Number Ewes bred Dec. 12-18	Total Number Ewes in groups May 1-19	Total Number Dry Ewes	Total Number Live Lambs June 20,1919	Average Weight of Lambs Nov. 6-19.	Average Weight previous Crop Lambs Oct. 22, 1918
					Lb.	Lb.
Hampshire...	75	71	8	51	60.8	66.4
Oxford	40	39	1	35	60.5	66.0
Cheviot.....	56	53	5	42	58.5	65.7
Leicester	68	66	4	58	56.4	62.2
Corriedale.	46	42	5	33	54.4	60.5
Shropshire.	50	50	2	45	51.7	59.4
Shropshire (original and black face ewes).....	75	73	2	75		
	410	394	27	329		

The following table shows the grades and average weights of the fleeces clipped from the first cross shearling ewes in June, 1919:—

---	Fine Medium Staple	Fine Medium Clothing	Medium Staple	Medium Clothing	Low Medium Staple	Average weight per fleece
	(Fleeces)	(Fleeces)	Fleeces)	(Fleeces)	(Fleeces)	
Corriedale.....	7	2	5	2	2	5.93
Hampshire.....	5	3	12	10	1	5.3
Leicester.....			20	3	6	5.87
Oxford.....	4	9	4	12		5.35
Cheviot.....	5	4	7	5		5.21
Shropshire.....	7	4	1	4		5.34
Original Shropshire.....		12	5	6	Low cloth- ing 2	4.57

Swine.—The hogs owned by this Station on March 31, 1920, numbered 76 head, composed of the following: Yorkshires, 20 sows and 2 boars; Berkshires, 26 sows and 2 boars; Duroc-Jerseys, 10 sows and 1 boar, and 15 feeder pigs.

The following table on the economy of gains with different breeds of hogs gives the four-year average on a total of over five hundred hogs:—

Breed	Average No. Pigs per per Litter	Pounds of grain required for 1 lb. pork	Dressing percentages for the Exp. of 1917 and 18
Berkshire ...	8.6	5.148	72.05
Yorkshire.....	10.4	5.153	74.63
Duroc-Jersey.....	8.7	5.706	74.47

Further work along this line is being done. Experiments on the value of hog pastures in pork production have been conducted for a number of years. A pasture of oats or barley or a mixture of these grains can easily be established which makes them particularly well suited to the farmer who wishes pasture. Oats have carried fully 1,000 pounds more pork per acre than barley. Rape sown both broadcast and in drills has been used with excellent results. The hogs pastured on hardy Grimm alfalfa were thrifty, developed good bone, and finished

SESSIONAL PAPER No. 16

off at a good weight for market. The cost of producing pork on sweet clover was very high. For early pasture a small area of fall rye may be found useful. With the exception of the sweet clover pasture, the cost of pork production was highest when hogs were fed in a small coral. The suitability of good screenings as a hog feed has been demonstrated but the advantage from cooking them is not sufficient to pay for the fuel and extra labour.

Sixty brood sows of Berkshire, Yorkshire, and Duroc-Jersey breeding were carried at a feed cost of \$3.90 per sow per month from November 15 to March 16.

POULTRY

Three breeds of poultry were kept: 173 White Wyandottes, 104 Barred Rocks, and 97 Rhode Island Reds, also 4 Toulouse and 5 African Geese, and 8 Pekin Ducks; 1,360 dozen eggs were produced at a cost for feed of 37.7 cents per doz. The average price received for the year was 45.7 cents per doz. It would appear from results of experiments that the use of electric light greatly stimulated egg production. As to whether this is sufficient to pay for the extra labour and cost of light is a subject for further test. Allowing for cost of eggs for incubation, fuel for incubators and brooders, and for feed use, 300 chickens were raised from hatching to maturity at a cost per head of 66.5 cents, or a cost per pound of 16 cents.

BEES

The dry summer of 1919 was not particularly suited to honey production since a number of plants failed to produce the usual abundant blossom. However, such a showing was made, that we feel warranted in saying that bees may profitably be kept as a side line on a great many farms in central Alberta. In the autumn of 1918, seven colonies were stored in the basement of the office in a dark room where uniform temperature was maintained by admitting heat from the furnace room when necessary. Two colonies died during the winter but the five colonies left threw off two swarms which were united, and six healthy colonies were put in the cellar in the fall of 1919. The largest production from any one hive was 115 pounds.

FIELD HUSBANDRY

Rotations.—Interesting data have been obtained from rotations now being conducted on this Station. The rotations being used are as follows: Rotation "C," 3 years' duration; Rotation "K," 6 years' duration; Rotation "O," 7 years' duration; Rotation "Main Farm," 6 years' duration.

Cultural Experiments.—Cultural experiments have been under way for seven seasons on over 450 plots, the data secured in this way are taken as a safe criterion of the method of cultivation suitable for districts such as Lacombe. Indeed in a great many cases, the results are applicable over all the western provinces. Some of the results of these experiments are given below.

The most economical depths to plough summer-fallow were found to be 6, 7, and 8 inches.

Fifty-one plots are used in a three-year rotation of summer-fallow, wheat and oats to determine the best method of summer-fallowing. Better yields were obtained by ploughing once for summer-fallow at a depth of 6 or 8 inches than by ploughing in the spring and again in the fall. A comparison of yields of plots ploughed May 15, June 15, and July 15, indicates the advisability of starting the summer-fallow work early.

11 GEORGE V, A. 1921

Autumn ploughing of wheat stubble for wheat and oats at a depth of four inches has yielded six bushels and four pounds more than by disking the land. In drier climates we would advocate the disc to follow the binder to hold weeds in check.

We have found it advisable at this Station to use a nurse crop in seeding down grass and clover. In drier districts, the use of a nurse crop cannot be recommended. Barley is the best suited for a nurse crop when one is used, and as a good seed bed, well firmed, is necessary for grass seed we have found the best results to follow summer-fallowing or a well tilled root crop.

Results show that green manuring is a little better than straight summer-fallow treatment.

We generally find three inches to be a satisfactory depth to seed wheat and oats in this section of Alberta.

FORAGE PLANTS

Experiments were carried on with sunflowers but results obtained were not conclusive.

Grasses and Clovers.—Fifty-five grass plots seeded in 1917 and one seeded in 1918 gave very good returns of hay this year. The best yields of hay were from the plots in which alfalfa was grown, viz., alfalfa and timothy, alfalfa and western rye grass, alfalfa and meadow fescue and alfalfa and Kentucky blue grass. Brome grass also yielded well but has the disadvantage of being hard to hold in check. Kentucky blue grass is more suitable for a permanent pasture than for a hay crop.

CEREALS

Twenty-three varieties of spring wheat were sown in uniform test plots each one-fortieth acre in size, on April 19. Marquis wheat is yet the standard variety for all districts not subject to very early frosts. Ruby (Ottawa 623) is superior to Prelude as an early wheat as it is not subject to smut, yields better and is a grain of splendid milling value. Ruby can be expected to ripen five to ten days earlier than Marquis and will yield within three or four bushels as much per acre.

Spring rye does not have a special or important place in this district. Fall rye is one of the most useful crops that can be grown, especially under arid conditions or when the soil is liable to blow.

Of the twelve varieties of oats under test, Banner was the highest yielder. This variety is recommended for the greater portion of central Alberta. Victory oats take second place in the list of five-year averages. Daubeney is one of the leading early varieties while the new hullless oat, Liberty (Ottawa 480), is a very satisfactory variety of this sort. In 1919 Liberty yielded at the rate of 1,400 pounds per acre which was slightly lower than usual.

Twenty varieties of barley were tested and Manchurian and O.A.C. No. 21 are the two most suitable sorts for central Alberta. Albert (Ottawa 54) is a very early sort that is useful in combating wild oats as it can be harvested before the oats have ripened.

An experiment was carried on to determine the value of cross sowing of wheat, oats and barley and results showed that no benefit can be expected from this practice.

Of the five varieties of peas grown, Chancellor, Solo and Arthur gave the highest yields in order of merit.

HORTICULTURE

Fruit.—Owing to the fact that the land was not in the best of shape, the old apple orchard which was discarded in 1918 was not replanted. It is the intention, however, to plant out the strongest and most promising of a number of seedlings received from Ottawa in 1915. Some Manitoba plum seedlings planted a few years ago

SESSIONAL PAPER No. 16

in the nursery bore fruit for the first time this year. Black currants did exceptionally well but red and white currants, raspberries and strawberries were not as productive as in previous years. Climax, Black Naples, Eagle, Red Grape and Pomona red currants were leaders in yields. Houghton gooseberries, Herbert raspberries and Senator Dunlap and August Luther strawberries were the highest producers in these sorts of fruits.

Vegetables.—Variety and cultural tests were carried on with vegetables as usual. The season was not very favourable for carrots, celery, parsnips and peppers. Average results were obtained from beets, cabbage, corn, cucumbers, peas, radish, salsify and turnips. Beans, lettuce, onions, pumpkins, squash and tomatoes gave excellent crop returns. Seed growing, fertilizer experiments and cultural experiments with potatoes were conducted. The usual variety tests with potatoes were carried on and good results were obtained.

Trees, Shrubs and Flowers.—Annual and perennial flowers made a splendid display of bloom. It was found that the peony and iris are both perfectly hardy. The salpiglossis, an annual, gave an abundance of bloom. The shrubs came through the mild winter of 1918-19 in good condition. The spruce and pine trees continue to make good progress. Russian and black poplars appear to be suitable for this district. Among the best hedges are the laurel-leaved willow, *Caragana arborescens*, native spruce, *Syringa villosa* and the Murray pine. In spite of the lack of rain the growth of grass was sufficient to add much to the beauty of the surroundings.

EXHIBITION AND EXTENSION WORK

No exhibition work was done during the year, owing to the pressure of work at the Station. Besides judging a number of standing crops in the Millet district, judging at the Lacombe Seed Fair, and addressing three local farmers' meetings during the year, no extension work was done.

EXPERIMENTAL STATION, SUMMERLAND, B.C.

REPORT OF THE SUPERINTENDENT, R. H. HELMER

THE SEASON

The past season has been most unfavourable to plant growth. The rainfall in the spring months was only 1.83 inches and owing to the municipality enlarging and cementing the main ditch from Trout creek, water was not available until May 15. The spring was very cold and crops did not start well. Water was not as plentiful as it should have been during the season. The months of July and August were very dry and hot and had a bad effect on plants. Many orchards in the district were seriously set back. In some districts leaves fell and the fruit shrivelled on the trees. Yields have been very low in almost all hoed crops. The potato yield throughout the district has been very poor and it is almost impossible to get good seed potatoes. The late spring, and the early frosts which occurred early in October greatly reduced the yield of tomatoes, melons and similar crops. The apple crop which was by far the largest in the history of the Okanagan was reduced by being frozen on the trees. Car and box shortage was partly to blame for this, but growers who took the advice given, and picked their apples and put them under the trees and covered them with straw, hay, or sacks, did not lose an apple. The winter has been steadily cold, the lowest recorded temperature being 5 degrees below zero in December. Very little ploughing has been

11 GEORGE V, A. 1921

done and spring work will have to be rushed. The nights have been cold during the months of February and March with sunshine during the days. This has had the effect of drying out the land very materially, the precipitation during those months being very light—.34 inch rain, 1.5 inches snow.

METEOROLOGICAL RECORDS

Month	Temperatures			Rain	Snow	Sunshine
	Maximum	Minimum	Mean			
1919	°	°	°	Inches	Inches	Hours
April ...	68.00	28.00	48.06	0.54		191.4
May	78.00	33.00	55.89	0.71		207.4
June	91.00	37.00	60.14	0.58		252.7
July	100.00	46.00	69.77	0.34		353.8
August ..	93.00	51.00	68.83	0.34		282.2
September ..	77.00	34.00	57.41	1.00		221.5
October ...	69.00	20.00	43.66	0.61	0.5	134.2
November ...	53.00	9.00	32.41	0.15	19.35	51.4
December..	51.00	—5.00	23.95	0.11	0.60	61.6
1920						
January.....	57.00	5.00	24.68	0.29	13.5	45.4
February.....	46.00	18.00	30.70		0.3	163.2
March.....	57.00	18.00	38.11	0.34	1.2	117.8
Totals.				5.01	35.45	2,082.6

LIVE STOCK

Horses.—We have seven horses on this Station, three work-teams and one driver. All are in good condition.

Cattle.—Experiments in steer feeding were again carried out. Twenty-five steers were brought from Calgary and two pens were fed alfalfa hay and straw, two other pens were fed alfalfa hay, straw and corn silage and another two pens were fed straw and corn silage. They all received the same grain ration. Silage gave such good results in the two pens in which it was used that we started feeding silage to the others, and these immediately showed better gains. The steers are the best we have fed and the better quality of the steers is reflected in the gains they have made.

Sheep.—We had 20 breeding ewes from which we got 35 lambs and not one of the lambs suffered from goitre. The ewes were fed two grains of potassium iodide daily in their grain. The lambs were remarkably strong and with the exception of one or two which were weaned too soon, made good growth.

Swine.—We had four brood sows which gave us 20 pigs in the spring and 10 in the fall. In every case where pigs were weaned too early they were retarded in their growth. Pigs were all brought up on alfalfa pasture supplemented with grain. We had four pens under feeding tests. At the present time we have eight brood sows.

POULTRY

Our laying stock consists of 212 White Wyandottes, with 15 adult males, 4 Bronze turkeys, 5 Pekin ducks and 10 Indian Runner ducks. In the spring of 1919 only fair success was obtained in the hatching of chicks, and the pullets did not mature as rapidly as they should have done. Trap-nesting is being carefully carried out and this year we have pens of pedigreed birds with good records from which we hope to build up our flock of heavy layers.

SESSIONAL PAPER No. 16

BEES

In the spring of 1919 we had three colonies of Italian bees. During the first honey flow these did well but owing to the very dry weather very little nectar was gathered later in the year. The best hive which we kept on the scales produced a surplus of 132 pounds. During the spring we purchased one 1-pound package and one 2-pound package of bees; these built up during the season and produced 42½ and 55 pounds surplus honey respectively.

FIELD HUSBANDRY

No definite policy has yet been laid down for field husbandry and the benches on this Station are hard to get into a suitable rotation. We are now hoping to put our alfalfa fields and corn land into a seven-year rotation if possible.

CEREALS

All cereals gave small yields on this Station, the water being turned on so late that the grain had started to head before we were able to irrigate it. Straw was very short in consequence, grain was very small and shrivelled and yields were low. The dry farm crops were total failures, nothing being harvested. Beans, which was the hoed crop in the rotation, gave a very small yield. Clover and timothy seeded with grain did not grow at all, the paths and roads being the only places where it grew.

FORAGE PLANTS

The Division of Forage Plants has made good progress during the year. Variety tests were again taken up in mangels, carrots, corn, various perennial and annual grasses and other plants such as thousand headed kale, Swiss chard, etc. These we hope to have under a rotation this coming year. Our seed work was again continued and this division has been of much assistance to the farmers of this district who have gone into seed growing on a small scale, and many farmers have come to see the seed crops at different times from planting to harvesting. We have also carried on experiments to find out the best method of planting alfalfa for seed and will carry this on further and on a bigger scale next year. Our root crops are now on a four-year rotation with barley as the grain crop for hog feed and alfalfa as the hay crop. Early frosts interfered greatly with the yields of roots and many were frozen in the ground.

HORTICULTURE

Fruits.—All trees did fairly well this year, but they did not make as much growth as the previous year owing to a shortage of water. The stone-fruit orchards did better this year than before as they got much better attention, an extra man being on orchard work. We had fruit on several of the trees this year, including some of the Ottawa seedlings.

Vegetables.—All hoed crops such as tomatoes, melons, etc., were not as good as usual owing to the late spring and early frosts in the fall. Selections in peppers, tomatoes, cucumbers and cabbage were again made and some good seed procured. This work will be continued next year and should prove of value to our seed growers.

Flowers.—The flower gardens were not as good as usual and seed work in connection with flowers was not as successful as many of the flowers were cut off by the early frosts before maturing seed.

11 GEORGE V, A. 1921

FERTILIZER EXPERIMENTS

This year the work in this division has been confined to tests with fertilizers applied with and without barnyard manure, the object being to gain data on the best sources of nitrogen under irrigation conditions. These experiments were conducted on eight plots of corn for silage, which included two check plots. These results were interesting but in no way conclusive; one of the check plots giving the largest yield. Experiments were also carried out in mangel seed production with and without manure.

BUILDINGS AND IMPROVEMENTS

New flumes have been built and several new measuring boxes installed. A boarding house with sleeping accommodation for about a dozen men, and a foreman's cottage, have been erected. The latter building will be temporarily occupied by the Superintendent. A log building has been built near the flower garden as an accommodation for visitors. This will be fitted up with a kitchen with facilities for boiling water, etc., and will no doubt be greatly appreciated by the many parties who come here for picnics during the summer. A good deal of work has been done on the roads during the past winter, grading, widening and shaling.

EXHIBITIONS AND MEETINGS ATTENDED

This Station had an exhibit at the following fairs: Kamloops, Armstrong, Kelowna, Peachland, Penticton, Naramata, Summerland, the New Westminster Provincial Fair, where we had a good display of home-grown seed, and at the Provincial Seed Fair held in Kamloops in January. The Superintendent attended the Irrigation Convention at Medicine Hat, several meetings connected with the seed growers of the province, and Farmers' Institute meetings at many of the towns in the district.

VISITORS

Each year shows a marked increase in the number of visitors to this Station. On May 24 we had a "get together" day and we had visitors from all the towns in the South Okanagan; it was estimated that 1,500 people visited the Station on that day. Members of neighbouring Farmers' Institutes have spent days on the Station and numerous parties have been shown over the Station.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE ACTING SUPERINTENDENT, R. G. NEWTON, B.S.A.

THE SEASON

The weather was extremely fine during April, and the soil was in fair condition so that spring seeding was practically finished by the 1st of May. During the latter part of May and early June the weather was quite cool and several frosts were recorded the hardest being on the 1st of June, when the thermometer registered five degrees. Toward the end of June and during July some very warm weather was experienced and it was necessary to irrigate the crops continually. Early in August the only heavy rain of the year occurred which brightened things considerably and brought the crops along to harvest.

SESSIONAL PAPER No. 16

Harvesting was completed under favourable weather conditions, and we were particularly fortunate in having the potatoes up when the heavy frost came the end of September. Practically all fall ploughing was completed before the freeze-up, early in November. Extremely cold weather was experienced during the first two weeks of December, the thermometer registering around thirty below zero most of the time. The snowfall this winter has been the heaviest since records were commenced in 1914. On the whole the various months of the past year have been characterized by extremes in one way or the other, as is readily noted in the following tables.

METEOROLOGICAL RECORDS

Month	Temperatures			Rain	Snow	Sunshine
	Maximum	Minimum	Mean			
1919	°	°	°	Inches	Inches	Hours
April.....	74	22	42.9	0.25	.....	199.0
May.....	83	25	49.3	0.84	0.12	209.7
June.....	92	30	56.26	0.60	.....	316.8
July.....	94	36	60.58	0.33	.....	312.2
August.....	89	35	60.55	2.42	.....	269.5
September.....	78	18	50.68	0.69	.....	203.6
October.....	70	6	35.24	0.48	2.25	121.3
November.....	53	-10	22.3	0.20	4.37	53.2
December.....	45	-34	12.85	0.11	9.12	71.3
1920						
January.....	42	-25	12.75	0.18	20.25	54.2
February.....	41	- 9	19.24	0.07	3.0	153.7
March.....	53	-10	27.55	0.06	6.12	157.3
Totals.....	.....	.....	37.52	6.23	45.23	2,121.8

PRECIPITATION, 1914-1919

Month	1914	1915	1916	1917	1918	1919
	Inches	Inches	Inches	Inches	Inches	Inches
April.....	1.25	1.14	0.62	0.23	0.39	0.25
May.....	1.46	1.01	2.89	2.85	0.93	0.85
June.....	1.59	3.92	2.01	1.96	0.36	0.60
July.....	1.57	3.79	2.32	0.29	1.32	0.33
August.....	0.75	0.67	2.01	1.20	3.23	2.42
September.....	2.16	0.72	1.15	0.75	0.85	0.69
October.....	0.77	0.90	0.54	0.41	1.12	0.70
November.....	0.79	0.90	0.33	0.38	0.53	0.64
December.....	0.42	0.58	0.30	2.59	1.53	1.02
	1915	1916	1917	1918	1919	1920
January.....	0.51	0.44	0.15	1.96	0.98	2.20
February.....	0.30	1.22	0.36	1.22	0.83	0.37
March.....	0.03	0.45	0.18	0.35	0.65	0.67
Totals.....	11.60	15.74	12.86	14.19	12.72	10.74
Average for six growing months, April-September.....						5.14
Average for six years						12.97
Average for six years for six growing months—April-September.....						10.64

MEAN TEMPERATURES, 1914-1919

Month	1914	1915	1916	1917	1918	1919	Average 6 years
	°	°	°	°	°	°	°
April.....	43.84	47.01	42.30	37.93	41.85	42.9	
May ..	51.98	52.07	46.55	50.25	47.76	49.3	
June ..	56.91	56.21	55.95	53.80	58.58	56.26	
July.....	64.48	60.30	64.48	64.40	62.87	60.58	
August ..	60.72	65.07	59.45	60.30	58.38	60.55	
September ..	49.78	49.51	49.66	51.53	55.28	50.68	
October ..	41.77	43.91	39.20	40.50	43.20	35.24	
November.....	30.68	24.33	22.05	32.05	28.83	22.30	
December ..	11.70	21.12	5.05	15.50	20.06	12.85	
	1915	1916	1917	1918	1919	1920	
January ..	13.12	4.79	12.35	14.70	19.76	12.75	
February ..	25.73	17.50	14.30	13.52	17.00	19.24	
March ..	33.12	32.90	22.40	30.50	28.11	27.55	
Totals	40.32	39.56	36.14	38.76	40.14	37.52	38.74

SUNSHINE RECORDS, 1914-1919

Month	1914	1915	1916	1917	1918	1919	Average 6 years
	Hours	Hours	Hours	Hours	Hours	Hours	Hours
April.....	165.1	208.7	182.5	168.9	261.9	199.0	
May ..	237.1	168.0	179.1	227.0	241.0	209.7	
June.....	198.4	187.7	202.0	230.2	302.1	316.8	
July ..	314.5	211.4	271.1	365.1	304.0	312.2	
August ..	267.9	269.9	269.0	300.4	214.0	269.5	
September...	148.3	151.8	192.2	142.9	232.4	203.6	
October.....	86.7	124.7	159.2	147.2	125.0	121.3	
November...	56.4	59.0	84.6	23.7	89.9	33.2	
December ..	86.8	43.4	84.4	38.2	28.4	21.3	
	1915	1916	1917	1918	1919	1920	
January.....	46.0	99.0	80.1	44.1	39.6	34.2	
February.....	70.9	97.8	99.8	80.9	79.2	153.7	
March ..	175.8	131.7	143.7	141.7	167.5	157.3	
Totals ..	1,853.9	1,763.1	1,947.7	1,910.3	2,085.0	2,121.8	1,945.4
Total daily average.....	5.1	4.8	5.3	5.2	5.7	5.8	

LIVE STOCK

Horses.—Three horses are kept at the Station, one work team, and one driver.

Cattle.—At present the herd consists of two milch cows and a registered Shorthorn bull. The latter is used by some of the local ranchers.

Swine.—Three Berkshire sows and one hog comprise the swine at the Station. Data are being collected on the cost of wintering brood sows, and some interesting figures will be available by another year.

POULTRY

The Farm flock at the present time consists of 150 Barred Rocks, 30 White Wyandottes and 11 Bronze turkeys. The results from the trap-nesting during the past year have been very encouraging.

SESSIONAL PAPER No. 16

A small pen of White Wyandottes averaged 227.7 eggs per bird, at a cost of \$4.51 for feed, and show a net profit of \$6.32 per hen. A pen of 50 Rocks averaged 146.1 eggs per hen at a cost of \$3.31 for feed, and show a profit of \$3.45 per hen.

Incubation.—The hatching records for the season were quite satisfactory. Of the 1,371 eggs set, 1,117 were fertile and produced 688 chicks; 508 of these were alive July 1, some died, others were cripples and were killed, and hawks accounted for not a few. This works out that for 2 eggs set 1 chick was hatched, and 2.7 eggs were required for every chick alive July 1.

Two makes of incubators were tried out, the Prairie State and the Cyphers, and equally good results were obtained.

With the various breeds some interesting figures were obtained. White Wyandottes required 2.7 eggs to produce a chick, Barred Rocks, 2.1, and White Leghorns, 1.5. In testing out hen eggs vs. pullet eggs for setting, it was found that it took 1.8 hen eggs to produce a chick, while 2.3 pullet eggs were required.

Various fattening trials were conducted last fall, ranging from 11 to 24 days. The average increase per bird was 14.2 ounces, produced at a cost of 13.7 cents per pound. The average profit per bird due to increase was, for crate-fed birds, 28.1 cents and for pen-fed birds 27.9 cents.

Thirty-four turkeys were raised last season and all but six were sold for breeding and eating.

The demand for setting eggs and young stock is steadily increasing and the Station cannot begin to fill the orders that are received.

BEES

The apiary numbered ten colonies in the fall of 1918. Two of these were wintered in the cellar, four in a trench, two in a double wintering case, and two in single wintering cases. The bees wintered outside proved by far the strongest in the spring, while three of the colonies wintered in the trench died as the result of too much moisture. From the seven colonies that were left 885 pounds of extracted honey were produced, or an average of 126.4 pounds per colony, the strongest colony producing 234 pounds of honey in the season. The total value of honey was \$292.05, or the average value per colony was \$41.72. The number of colonies were increased from seven to eleven and in September they were fed 180 pounds of sugar. Seven of the colonies were wintered in Kootenay frames and four in a wintering box. When they were examined toward the end of March, it was found that they had all come through the winter and most of the colonies were strong.

FIELD HUSBANDRY

Rotations.—On the irrigated portion of the Station the three-year, four-year and five-year rotations were continued with fair success. The cereals were inclined to be uneven in growth and gave only fair returns. Peas did remarkably well, but the plots of mangels were poor, due to the cutworms and poor germination. Two applications of poisoned bran mash were applied with only fair results. Clover fits well into the rotations and gave very good returns, but is apt to winter-kill some years. Potatoes continue to give excellent yields and as a money-making crop are hard to equal.

The six-year rotation on the dry land was a complete failure, which again goes to show that irrigation is essential to this district.

The following is a list of rotations under test:—

Rotation "A".—Hoed crop (roots), wheat, peas, oats.

Rotation "B".—Wheat, roots, oats seeded to clover, clover, clover.

Rotation "J".—Oats seeded to clover, clover, potatoes.

11 GEORGE V, A. 1921

The following table shows the cost, the returns and the profit per acre for the above rotations, at current prices:—

Rotation	Duration	Cost per acre	Returns per acre	Profit per acre
	Years	\$ cts.	\$ cts.	\$ cts.
"A".....	4	42 22	115 75	73 53
"B".....	5	32 64	68 45	35 81
"J".....	3	50 25	283 09	232 84

IRRIGATION WATER RECORD

The following irrigation chart for the past six years on Rotation "A" may be of interest, especially as it shows that this past season has been rather abnormal in regard to precipitation.

IRRIGATION CHART 4-YEAR ROTATION "A"

—	Total precipitation for year	Total precipitation 4 months April-July	Acre- inches used on roots	Acre- inches used on wheat	Acre- inches used on peas	Acre- inches used on oats	Total for year
1914.....	12.91	5.87	12.78	9.27	11.40	5.89	9.83
1915.....	14.47	9.86	2.03	5.04	5.84	6.73	4.91
1916.....	14.28	7.84	1.62	Nil	3.52	Nil	1.31
1917.....	11.70	5.33	5.75	7.55	9.69	4.14	6.78
1918.....	13.79	3.00	18.30	9.91	9.57	11.38	12.29
1919.....	10.74	2.03	6.12	13.17	10.04	7.46	9.19
Average amount of water used per acre, in acre-inches.....			7.77	7.49	8.34	5.93	7.38

FERTILIZING EXPERIMENT

A fertilizing experiment was commenced this year to run through a three-year rotation viz.—Potatoes, oats and clover.

The object of this test was, first, to ascertain the effect of omitting in turn each element of plant food from a fertilizer mixture, and second, to ascertain the relative influence under irrigation of nitrogen in various forms.

SESSIONAL PAPER No. 16

The following table summarizes the results with potatoes this past season. Wee Macgregor potatoes were used as seed. They were seeded May 16 and harvested September 30. The plots were irrigated June 14 and August 26.

Plot	Manure	Quantity per acre	Yield in tons per acre	
		Lbs.	Tons	Lbs.
1	No manure.....	.....	19	400
2	Acid phosphate.....	500	17	480
	Muriate of potash.....	160		
3	Sulphate of ammonia.....	160	17	800
	Muriate of potash.....	160		
4	Sulphate of ammonia.....	160	20	400
	Acid phosphate.....	500		
5	Acid phosphate.....	500	19	600
	Sulphate of ammonia.....	160		
	Muriate of potash.....	160		
6	No manure.....	.....	18	160
7	Barnyard manure.....	15 tons	21	1,600
8	Sulphate of ammonia.....	80	19	400
	Acid phosphate.....	250		
	Muriate of potash.....	80		
	Barnyard manure.....	10 tons		
9	Nitrate of soda.....	210	17	
	Acid phosphate.....	500		
	Muriate of potash.....	160		
10	Dried blood.....	280	21	1,440
	Acid phosphate.....	500		
	Muriate of potash.....	160		

CULTURAL EXPERIMENTS

The cultural test with oats is proving very interesting and shows quite conclusively the value of barnyard manure as a fertilizer, and clover as a green manure. The following table shows the yields from the various plots for the past three years.

CULTURAL EXPERIMENT WITH OATS

Detail	Yields			
	1917	1918	1919	3 year average
	Bush.	Bush.	Bush.	Bush.
Oats continuously manured 12 tons per year.....	40.7	25.4	85.3	50.4
Oats seeded to clover, and clover ploughed in.....	25.4	23.3	67.8	38.8
Oats—summerfallow.....	38.4	13	54	35.1
Oats continuously.....	34.7	22.5	43.5	33.5

FORAGE CROPS

Clover and Alfalfa with Grass Mixtures.—An experiment was commenced in 1917 to compare the results of various mixtures of grasses sown with clover, with similar mixtures sown with alfalfa, for hay. The plots were seeded June 15, 1917, and no crop was taken the first year, but the plots were cut over once and a few inches of growth left on the plot. The plots were irrigated when necessary and two cuttings have been taken each year for the past two years. So far the clover and grass mixtures outyielded the alfalfa and grasses, while in some of the plots the alfalfa has crowded or smothered the grass nearly out. It would appear therefore that the clover and grasses are better adapted for a hay mixture than alfalfa grasses. The following table summarizes the experiment to date:—

11 GEORGE V, A. 1921

Alfalfa and Grass Mixtures					Red Clover and Grass Mixtures				
Plot No.	Mixture	Weight seed sown per acre	1918		Plot No.	Mixture	Weight seed sown per acre	1918	
			Total yield hay per acre (2 cuts)	Tons				Total yield hay per acre (2 cuts)	Tons
1	Alfalfa	10	4.6	5.87	1	Red clover	10	5.13	5.88
2	Timothy	8			2	Timothy	8		
	Alfalfa	10				Red clover	10		
3	Western rye	10	4.62	5.46	3	Western rye	10	6.88	5.88
	Alfalfa	10				Red clover	10		
4	Meadow fescue	15	5.00	5.28	4	Meadow fescue	15	6.9	5.79
	Alfalfa	10				Red clover	10		
5	Orchard grass	15	4.65	4.74		Orchard grass	15	6.12	6.15
	Alfalfa	10			5	Red clover	10		
6	Tall oat grass	15	3.6	3.54		Tall oat grass	15	5.91	6.21
	Alfalfa	10			6	Red clover	10		
	Timothy	2				Timothy	2		
	Western rye	3				Western rye	3		
	Meadow fescue	34				Meadow fescue	34		
	Orchard grass	34				Orchard grass	34		
	Tall oat grass	34	5.16	3.51		Tall oat grass	34	6.63	6.12
7	Alfalfa alone	12	4.41	3.94	7	Red clover alone	12	5.94	4.9

SESSIONAL PAPER No. 16

Alfalfa.—Alfalfa as a permanent crop is steadily increasing in favour in this district. It is not so liable to winter-kill as clover and produces two fine cuttings, running from three to four tons per acre. This season six acres of new land was seeded to alfalfa late in July and by fall there was a fine stand. This appears to have come through the winter without injury.

Soiling Crops.—Experiments were continued with rape, Thousand Headed kale, and Swiss chard. These yielded in the order named, but the results were not quite so good as in previous years.

Roots.—This past season the ordinary variety tests were enlarged, embracing 37 varieties of mangels, and 29 varieties of carrots. This was done in order to ascertain the purity of the various strains, from different seed houses. Seed grown on the Experimental Farms System proved to be more true to type and gave higher yields than seed obtained from the seed houses. Giant Yellow Intermediate (Ottawa) was the best yielding mangel, and the White Intermediate carrot (Summerland) proved the best carrot.

Sugar Beets.—Tests were continued with the following sugar beets: Wohanka, Chatham, B. C. Grown, and Waterloo. The yields were in the order named.

Corn.—Eight varieties of corn were seeded this season on June 28, and harvested on September 1. The yields varied from 14 tons 200 pounds to 19 tons 1,200 pounds per acre. Wisconsin No. 7 gave the highest yield, with Canada Yellow following. Most of the corn when cut was in the late milk or dough stage, and a few cobs were found on each variety.

CEREALS

With the cereals a five-year rotation is followed, viz., peas ploughed under, cereals seeded to clover, clover, second crop ploughed under, peas (seed), cereals. The following is a summary of the various grains grown this past year:—

Wheat.—Four varieties were under test, Huron, Marquis, Kubanka and Ruby, and the yield was in the order named.

Oats.—Banner, Daubenay and Liberty were tried out this past season. Banner yielded at the rate of 101 bushels to the acre. Liberty was very poor, considerable smut being present.

Barley.—Four varieties were tested which yielded in the following order: Gold, Guymalaye, Manchurian and Success. An interesting side experiment was conducted with Success barley. One plot was cut for green feed on June 28, irrigated and forced into second growth and left to mature, with the following results:—

- Plot 1 yielded 2,200 pounds of grain per acre.
 - Plot 2 yielded 2.6 tons of green feed and 1,280 pounds of grain.
- This experiment will be continued and the green feed analysed to ascertain its feed value.

Peas.—Remarkable yields were obtained with peas this past season. As yet no sign of mildew, weevil or aphid has been noticed. More attention should be given this crop as it is easy to harvest and a money-maker. The following list gives the varieties and their corresponding yields:—

	Bush.	Lb.
Prussian Blue.. . . .	89	20
Solo.. . . .	70	..
Arthur Select.. . . .	67	20
Chancellor.. . . .	67	20
Golden Vine.. . . .	60	..
Average for all varieties.. . . .	70	48

HORTICULTURE

The season was on the whole unfavourable. The spring was cold and frosts were experienced up to June 7. On the 1st of June a frost of 5 degrees killed most of the tender vegetables and the hardier varieties had a decided setback. Cold drying winds prevailed until July and vegetation made but very little growth.

Potatoes.—Although the season was bad, potatoes did very well and the variety tests showed some very satisfactory yields.

	Yield per acre	
	Tons	lb.
Wee McGregor..	25	1,480
Ashcroft..	25	160
Eureka Extra Early..	23	1,896
Cambridge Russett..	23	992
Snow..	22	1,936
Delaware..	21	1,560
Early Northern..	21	1,296
Suttons Abundance..	20	1,976
Carman No. 1..	20	1,184

These varieties of potatoes were planted May 17 and harvested September 29. They were quite free from disease with the exception of a little scab. Water was applied three times during the season.

Beans.—Beans were a fair crop, but the first seeding was destroyed by the severe frost the first of June, with the exception of Plentiful French, which survived and yielded a medium crop. The second seeding on June 1 was attacked by red spider, which seriously affected the crop.

Beets.—Beets sown April 28 gave heavy yields, but this date is too early to produce beets for winter storing. A later seeding on July 22 yielded roots up to 3 inches in diameter by September 20.

Cabbages.—It was a very trying season for the cabbages. The cold of May and June crippled the seedling plants and during the remainder of the growing season they were attacked by cutworms, larvæ of the moth and butterfly, and aphids. Best results were obtained from Early Jersey Wakefield, Copenhagen Market and Improved Brunswick. The Chinese cabbage proved very useful as an early vegetable.

Cauliflowers.—Only fair results were obtained with cauliflowers this past season.

Carrots.—Carrots suffered badly from the cold spring, which affected the germination and resulted in a poor stand.

Cucumbers, Melons and Citrons.—It has now been pretty well demonstrated that these plants are too tender for climatic conditions in this valley.

Corn.—Good yields of corn were procured from some of the earlier varieties such as Early Malakoff, White Alberta, Nordheim Extra Early, and Early Malcolm.

Lettuce.—Lettuce was a good crop especially Hanson, Giant Crystal Head, Trianon Cos, and Grand Rapids.

Onions.—Onions were a poor crop being badly infested with maggots.

Parsley and Parsnips.—These did very well, especially Improved Hollow Crown C.E.F. parsnips.

Peas.—Peas do remarkably well in this district. The early sown seed suffered from the frost and germinated poorly. Thos. Laxton was the earliest, being six days ahead of Gregory's Surprise.

SESSIONAL PAPER No. 16

Tomatoes.—The tomato plants were very late this year and for this reason were grown on single stem and stopped at second truss. Alacrity, Langdons Earliana, and Bonny Best proved the best.

Small Fruits.—Gooseberries were the best of the small fruits this season, Oregon Champion averaging 20 pounds to the bush.

With the red currants, Fays Prolific produced 20 pounds per bush and Perfection 11 pounds.

Black currants were not so good this year having been too heavily pruned the preceding year.

Tree Fruits.—A few of the apple trees came into bearing this year, and the following varieties promise well for this district: Wealthy, Yellow Transparent, Rupert, Dudley, Okabena, and Pinto.

Hyslop and Transcendent crabs gave a large yield.

The fruit was very clean with no trace of scab or fungous diseases.

Flowers.—A limited display of annuals was made this year. Antirrhinums, asters, stocks, and various hardy annuals were chiefly used, and they made a bright showing.

Hedges.—Various hedge plants are being tested out and on the whole those indigenous to the locality prove best, Douglas fir, spruce and juniper excelling. Introductions from outside are the Lance-leaved willow, and the Caragana.

EXHIBITIONS AND MEETINGS ATTENDED

The Station exhibit was shown at the following fall fairs: Kaslo, Nakusp, Trail, Nelson, Creston, Cranbrook, and an exhibit of Farm produce was shown at Athalmer. The exhibit aroused a great deal of interest, and that it was appreciated was shown by the large number of inquiries made, and circulars distributed.

The Superintendent attended Creston, Athalmer and Cranbrook fairs, and at the latter judged live stock, poultry and dairy products.

During the year the following meetings or conventions were attended: Western Canada Irrigation Convention, Medicine Hat; District Farmers' Institute meeting at Cranbrook, and most of the local meetings in connection with the Agricultural Association, Stock Breeders' Association, and Board of Trade.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE OFFICER-IN-CHARGE, W. H. HICKS, B.S.A.

THE SEASON

The total precipitation of 76.16 inches for the year 1919-20 was larger than average but was 2.44 inches less than that of the preceding year. The months of April and May were cool, damp and cloudy, resulting in a late spring. Very little work was accomplished on the land in April and when the seed was finally sown, the cool temperature retarded growth. Up to the end of June hay and pasture crops did remarkably well under these conditions, but cereal, corn, root and potato crops were late. July and August were very dry and, although the first crop of hay yielded exceptionally well and was saved in good condition, the second crop of hay and late summer pastures were poor. The cereal crops ripened too rapidly for heavy yields. September was very dry with the exception of two rains which occurred about the 12th and 28th. These rains helped the pastures and gave the root crops a new start but were too late

11 GEORGE V, A. 1921

to be of much benefit. October goes on record as being the coldest October known here. A large percentage of corn in the Fraser valley was frozen during the first week. The middle of the month was damp, cool and cloudy. On the 23rd another sudden change took place. Very strong winds blew from the north and frosts occurred during the nights. The climax was reached on the 26th when the wind calmed down and twelve degrees of frost were recorded. November was the wettest for ten years. December and January were about normal, while February was exceptionally mild, dry and bright. Some ploughing was done in February and March. The latter month had average weather conditions.

METEOROLOGICAL RECORDS

Month	Max. Temperature					Precipitation			Sunshine hours
	Date	Degrees	Date	Degrees	Mean	Rain	Snow	Total	
1919		°		°	°	Inches	Inches	Inches	
April ..	30	71	8	30	49.49	6.26		6.26	120.0
May ..	22	78	3	32	52.06	4.71		4.71	156.6
June	18	86	7	35	57.73	2.68		2.68	152.8
July.....	14	92	18	44	64.49	0.66		0.66	253.3
August	10	86	23	46	63.85	0.45		0.45	191.5
September...	14	86	28	32	60.98	6.7		6.7	148.2
October.....	6	68	27	20	46.11	5.9		5.9	116.5
November...	20	53	26	25	41.09	15.31	3	15.61	28.2
December....	28	54	13	8	34.65	8.93	7	9.63	75.4
1920									
January.....	14	52	21	18	36.21	13.98	11	15.08	53.8
February.....	29	56	14	26	40.20	2.04		2.04	143.6
March.	22	61	1	26	43.06	6.44		6.44	88.2
						74.06	21	76.16	1,528.1

LIVE STOCK

Horses.—A very nice group of Clydesdale females is being collected on the Agassiz Farm. This group consists of four mature mares, three yearling fillies and one filly foal. The young animals in particular are nice individuals. Ten grade horses and a driver are also kept. No experimental work of any kind was attempted with the horses, but figures are being compiled on the cost of raising and maintaining horses.

Cattle.—The size of the dairy cattle herd has been slightly reduced during the year. The policy has been to dispose of the grade cows not required in the grading experiment, as the pure-bred herd is now sufficiently large to allow us to dispose of all the grades. At the close of the year the herd numbers seventy-two head; forty-nine of these are pure-bred and twenty-three grade Holsteins. A young bull sired by Freind Hengerveld DeKol Butter Boy from a daughter of Pontiac Aaggie Korndyke was selected for a herd sire. He is developing into a good bull. Further tests for tuberculosis failed to locate the disease in the herd, which has now been clean for seven years.

Of the twenty-seven cows which finished a lactation period during the year fifty per cent gave heifer calves. The average milk production for these twenty-seven cows is 10,198.9 pounds for an average lactation period of 342 days. This is an average increase per cow of over one thousand pounds of milk more than any previous year. This is a good average considering that eight of the records were made by two-year-old heifers. The best record was made by Agassiz Segis May Echo as a junior two-year-old. She produced in the year 19,302 pounds of milk and 842.5 pounds of butter. The two-year-old cow, Agassiz Pietje Priscilla Korndyke, produced 13,956

SESSIONAL PAPER No. 16

pounds of milk and 570 pounds of butter, while her full sister, Agassiz Priscilla Korndyke, as a three-year-old gave 18,731 pounds of milk and 822.5 pounds of butter. By making this record Agassiz Priscilla Korndyke won first prize in the three-year class of the Holstein Record of Performance. Her sister, Agassiz Pietje Korndyke won first in the four-year-old class and Aurora Meechthilde won seventh in the mature class with their records as shown in our last report. With these records the herd won more Record of Performance prize money than any other herd in Canada.

Not only was the production of the herd of a high standard but laurels were won at Vancouver and Westminster Exhibitions in competition with the best herds in the province. At Vancouver the most important winnings were: For bulls, two years, second; junior yearling, first; junior calf, first; and for females: mature cows, second; cow with record, second; cow, three years with record, first; aged herd, second; two animals produce of cow with a yearly record, first and third; three animals get of sire, second; the latter in a very strong class of twenty-seven animals. At New Westminster Exhibition the placings secured were, bull, junior yearling, first and second; cows two years, second; senior yearling, second; senior calf, second; aged herd, second. Agassiz Pietje Korndyke won first in the mature cow class and also grand championship. She also won the milk and butter tests at both Vancouver and Westminster Exhibitions.

In experimental feeding work turnips produced more milk and butter than mangels, when pulped and mixed with silage and straw. In comparing crushed barley with crushed screenings the former produced more milk and butter, but figuring barley at \$72 per ton and screenings at \$45 per ton, actual cost, the latter gave the cheaper product. By adding skim-milk to a small quantity of whole milk and feeding more grain, greater and cheaper gains were made with growing calves than feeding smaller quantities of whole milk.

Dairy.—A considerable portion of last year's dairy work consisted in giving instruction in elementary dairying to returned soldiers. Each group of men spent three days in the dairy and were given brief, practical and theoretical instruction in the care of milk, butter, cream cheesemaking and milk testing.

The regular shipment of cream cheese to Vancouver was maintained, the total for the year being 4,403 pounds. During the months of March to July, inclusive, Stilton cheese was made weekly and this was all marketed at 40 cents per pound. The manufacture was recommenced at the beginning of February, 1920. The year's milk testing comprised seven-day records for nine cows and one thirty-day record as well as the usual weekly test for the herd. Samples were also tested for farmers in the province who cared to avail themselves of the opportunity.

Sheep.—The flock has passed another successful year with very little trouble or sickness recorded. It consists of two rams and fifty ewes of the Dorset breed, one Oxford Down ram, twenty-eight grade ewes and eighty-seven spring lambs. The fifty-six ewes forming the breeding flock gave birth to ninety-four lambs and raised eighty-seven of them, or 155.3 per cent.

The 1919 wool clip from eighty-one sheep totalled 648 pounds or an average of eight pounds per fleece. The wool was sold through the Vancouver Island Flockmasters' Association for fifty-three cents per pound.

The sheep grading experiment was continued as formerly with gratifying results. The grade Dorsets are showing more Dorset type as each cross is made, a number of them being indistinguishable from the pure-breds. The Oxford type is also showing up well in the Oxford crosses, but a large percentage of these lambs have been males so that results in this experiment are somewhat delayed.

No fall lambs were raised this year. Good prices were obtained for ten spring lambs sold at Easter. These lambs averaged fifty-seven days of age and sold for \$17.60 each. This promises to be a profitable branch of the sheep business and with

11 GEORGE V, A. 1921

remuneration such as this should not be neglected. If the ewes are bred to drop lambs early in January and the buck lambs sold at Easter, the ewe lambs get an excellent opportunity to develop rapidly.

An exhibit of sheep was shown at Vancouver and Westminster Exhibitions. All the important prizes were won by the flock in the Dorset classes at both exhibitions including champion ram, champion ewe, first for pens and first for fat lambs any breed.

Swine.—At the end of the year there were on hand two boars, nine sows, fifty-six sucking pigs, all pure-bred Yorkshires. Ten sows owned during the year farrowed eighteen litters with a total of 189 pigs of which 164 were raised, or 86.7 per cent. This makes a total of about nine pigs per litter raised.

There was a good demand for breeding stock during the year, 24 young sows and 11 boars being sold for that purpose. The remainder of the young pigs were retained for experimental feeding purposes.

The experimental work in swine feeding consisted of comparing the self-feeder with trough-feeding and a comparison of feeding varying quantities of skim-milk with no milk and milk substitutes. In the production of 100 pounds of pork the trough-feeding method cost slightly more than that of self-feeding. Taking labour into consideration the advantage of the self-feeder can be still further emphasized. In the feeding of skim-milk an effort was made to find the most economical amount to feed young pigs. Eight lots, with six pigs in each lot, were used in this experiment. They were all fed the same meal mixture and given all they would consume. Lots 1 and 5 received neither skim-milk nor substitute in addition to the grain ration while lots 2, 3 and 4 received 4, 6 and 8 pounds of skim-milk per pig per day respectively in addition. Lot 6 received as an addition to the meal mixture 10 per cent linseed meal, while lot 7 received an addition of 10 per cent tankage. Lot 8 received an addition of 10 per cent tankage, increased after four weeks to 20 per cent tankage. The most profitable returns were obtained from the pigs fed 8 pounds of skim-milk per pig per day while those fed 6 pounds per pig per day came second.

Tankage fed at the rate of 10 per cent was found to be a valuable substitute for skim-milk but not if fed at as high a rate as 20 per cent.

Ten per cent linseed meal gave satisfaction in the early stages of feeding but not towards the end of the experiment. The suggestion in that case possibly is that a higher percentage would have given better results.

Feeding the above meal mixture without adding skim-milk or substitute gave unsatisfactory results.

POULTRY

Weather conditions during the winter were favourable for egg production but hatching in the spring was poor, possibly on account of the heavy egg production in the winter months, which lowered to some extent the vitality of the breeding stock.

The birds wintered were: Barred Rock hens, 100, pullets, 125; White Wyandotte hens, 3, pullets, 34; White Leghorn hens, 60, pullets, 95.

The feed used consisted of wheat, germinated oats, dry mash, mangels and skim-milk. Experiments being carried out are: confinement versus fenced runs, self-feeding in hoppers versus hand feeding in litter, and sand on the floor versus straw for litter. All birds are trapnested and records of their performance kept. Records are also kept of the cost of production, fertility, hatchability and livability of the various matings. Only birds with an egg production of over 150 eggs are used for breeding purposes. A large number of eggs were sold for hatching. The birds have shown very good returns over cost of production in spite of the high cost of feed which was purchased at market price.

SESSIONAL PAPER No. 16

BEES

The season opened with three colonies of rather vicious hybrids, one of which swarmed rather early. Two colonies weakened towards the end of the summer and were united, leaving only three to winter. These colonies should have been requeened with pure Italians but just at that time queens were not procurable. One hive was placed on scales and records kept of the daily production. The total honey crop extracted was ninety-four pounds, an average of thirty-one pounds per hive.

FIELD HUSBANDRY

Rotations.—No changes have been made in crop rotation work. In the four-year rotation the following crops are grown: First year, hoed crop, corn and roots; second year, grain seeded down; third year, hay; fourth year, pasture.

Fifty acres of land were rented upon which grain was grown for feeding purposes. On thirty acres of the rented land accurate figures were kept on the cost of growing oats. The results were very satisfactory as the grain was grown for \$30 per ton.

Crop Yields.—The following table shows the amount of each crop grown on the farm as well as the rented area in 1919:—

Crop	Yield	
	Tons	lb.
Corn silage.. . . .	259	1,110
Clover silage.. . . .	25	1,870
Clover hay.. . . .	162	90
Mangels.. . . .	81	—
Carrots.. . . .	7	—
Sugar beets.. . . .	2	—
Potatoes.. . . .	4	900
Mixed grain.. . . .	34	1,650
Oats.. . . .	32	400
Peas.. . . .	1	200
Barley.. . . .	....	1,260

Cultural Experiments.—The cultural experimental work was continued as previously. The crop yields were poor on all plots, especially in the hoed crop section on the plots where no fertilizer was applied.

FERTILIZER EXPERIMENTS

The fertilizer experiment "E 7" as commenced in 1918 was continued. The crop grown was oats. In the spring twelve plots in the group were divided and an additional quantity of fertilizer added to one-half of each plot. In almost every instance the extra fertilizer more than doubled the crop yield.

CEREALS

The usual variety tests of cereal crops were conducted on uniform plots. The seed was sown April 15. Ten varieties of oats were tested. Owing to a poor stand the old favourite, Banner, gave the poorest possible yield, Irish Victor and O.A.C. No. 72 doing best. Daubeney and Liberty, the earliest varieties, matured in 107 days. The six-row varieties of barley compared favourably with the two-row sorts. Danish Chevalier yielded the most with the six-row varieties Oderbruck and Odessa coming second and third respectively. Only six varieties of peas were tested. Solo was again the heaviest yielder. A mixture of Arthur peas and Banner oats gave a better grain yield than Solo peas and Banner oats. Norwegian beans sown in drills thirty inches apart yielded at the rate of 1,700 pounds per acre. A plot of Marquis wheat yielded at the rate of eighteen bushels per acre.

11 GEORGE V, A. 1921

FORAGE CROPS

Corn.—Twelve varieties of corn were tested. They were sown June 4 and harvested September 24. The late, large growing varieties such as Leaming, White Cap Yellow Dent, and Bailey, gave the heaviest yields while Longfellow and Northwestern Dent gave corn of better quality for ensilage purposes.

Roots.—Thirty-seven plots of mangels of 1-100th acre size were grown from seed of different varieties and from different sources. The results obtained are very interesting. The late, cool spring and the dry, hot summer curtailed the yields or possibly the results obtained would have been different. McKenzies Peerless gave the greatest yield. The largest crop of carrots grown on twenty-four plots was White Intermediate grown from Summerland seed. Chatham grown sugar beet seed produced a heavier crop of sugar beets than B.C. grown seed or the Wohanka and Waterloo varieties.

Grasses and Clovers.—The trees in the orchard where the grass and clover plots are situated have grown so large that they shade the plots, with the result that the yields obtained are not representative.

Root Seed.—On account of late planting, which was done between May 9 and 19, the cool, wet spring, followed by the dry, hot summer, and a light attack of aphids just before maturing, the root seed was almost a failure. Only 1,500 pounds of number one seed were produced on seven acres. The variety was Yellow Leviathan.

HORTICULTURE

Following the mild winter of 1918-19 the spring was cold and wet and unusually late; as a consequence most garden produce was late in maturing. The ornamental shrubs and trees blossomed well though rather later than usual.

Fruits.—Small fruits did well, currants, raspberries and blackberries exceptionally so, though strawberries and gooseberries were a failure owing to the ravages of strawberry weevil and mildew. Prunes and cherries bore heavily and were free of disease. Apples and pears yielded only small crops and these were of an indifferent quality.

Vegetables.—The usual tests in potato culture were carried on with satisfactory results. The rest of the horticultural work consisted of a continuation of the seed growing commenced last year, the roots saved from last year's growing being replanted and in all cases a quantity of seed was grown which was all of good quality and well ripened.

Flowers.—The roses did very well, bearing a lot of bloom of good quality. We have renewed many of the dead bushes and have planted several new varieties as well. Perennials and annuals were good. Annual seed from many of the other Experimental Farms was tested with commercial seed and made a most favourable showing, Summerland seed again was exceptionally good. A quantity of seed was saved and will be sown here during the coming season.

FARM IMPROVEMENTS

Buildings.—A new horse barn, sufficiently large to accommodate eighteen horses, was erected on a site east of the main barn. The implement shed was moved from its old position to one more suitable. A new office was built in a convenient location and is serving the purpose well for which it was intended. Numerous small repairs and improvements were made to the buildings and fences on the Farm, but no new fences were built, except those of a temporary nature.

SESSIONAL PAPER No. 16

Land Clearing.—Underbrushing the remaining uncleared area on the east side of the farm was completed. Four acres of land that had been previously underbrushed were stumped, levelled and ploughed, and put in readiness for planting.

TRAINING RETURNED SOLDIERS

In conjunction with the Soldiers' Settlement Board some three hundred returned soldiers received a short training course in practical agriculture between the months of April and November. The course lasted six weeks during which time each man was required to do practical work in each of the following lines: General farm work, horses, cattle and dairying, sheep and swine, poultry, gardening and land clearing.

EXHIBITIONS

In co-operation with the Sidney and Summerland Stations an agricultural exhibit was displayed at Vancouver and New Westminster Exhibitions. Excellent exhibits of Holstein cattle, Dorset sheep and Yorkshire swine were also shown at these two exhibitions. No exhibition work was done at the smaller local fairs.

MEETINGS

The Superintendent attended the following fairs and meetings: New Westminster Exhibition Committee meeting, B.C. Dairymen's Association meetings at Milner, Chilliwack and Comox, Vancouver Exhibition, Chilliwack Exhibition, New Westminster Exhibition, Chilliwack School Garden Competition, East Chilliwack Institute meeting, B. C. Holstein Breeders' Association sale, Western Canada Livestock Union, Victoria, Western International Stock Show, Portland, Coqualeetza Institute, Sardis, Dairymen's Convention, Vancouver, Annual Meeting New Westminster Fair Board, Livestock Meetings, Toronto, and Bull Sale, Kamloops.

VISITORS

It is estimated that about 2,000 people visited the Farm during the year.

EXPERIMENTAL STATION FOR VANCOUVER ISLAND, B.C.

REPORT OF THE SUPERINTENDENT, LIONEL STEVENSON, M.S.

SEASONAL NOTES

The climatic conditions experienced during the period of growth averaged lower in rainfall and temperature than is usual for the district. The spring seeding operations were finished later owing to the backward weather in April. Beneficial rains ceased April 30 and were not experienced again until late in the autumn. Autumn-sown crops and all plants of a biennial or perennial character withstood the drought conditions without injury, while annuals did not do at all well. More food plants of a perennial character are advised for the district.

METEOROLOGICAL RECORDS

Month	Temperature			Precipitation	Sunshine	
	Highest	Lowest	Mean		Minimum	Possible
	°	°	°	Inches	Hours	Hours
April	61.0	32.0	46.7	2.15	168.30	411
May	71.0	36.0	51.7	1.18	251.30	473
June.....	75.5	38.0	51.0	0.77	255.42	482
July.....	84.5	45.0	61.33	0.27	365.18	486
August...	85.0	40.0	60.5	0.06	312.24	444
September	76.00	39.9	57.30	1.85	213.	377
October...	67.0	32.0	48.0	1.30	136.22	335
November.....	56.0	28.0	42.0	5.94	43.6	276
December.....	52.0	14.0	33.0	4.75	68.44	259
January.....	54.0	23.0	37.0	3.28	49.6	273
February.....	53.0	29.0	39.1	0.61	134.50	286
March.....	56.0	25.5	41.4	2.87	108.26	370
Total for year.....				25.06	2,106.06	4,472

LIVE STOCK

Horses.—The four work geldings that have been in use during the past seven years were used for land tillage and improvement work on the Station during the year. These horses have been maintained in good health and condition on the following ration: one pound of crushed oats and one pound of mixed hay for each one hundred pounds weight of horse. Carrots were fed during the winter season and week-end pasture was provided during the summer. When not used for farm work, the horses were employed teaming gravel, stone and lumber.

Cattle.—The Jersey herd established in 1916 has been continued. Two cows exceeded the four-pound fat standard. The herd now consists of fifteen head of females. The granddaughters of “Rosalind of Old Basing” have failed as dairy cows, and are being replaced by heifers of other lines of breeding.

Females were in active demand but there was little demand for young bulls.

Swine.—A number of choice young Berkshires were sold to farmers of the district. Two young sows were retained for breeding and maintenance cost experiments. One fine young boar was imported from Alberta.

Sheep.—A small flock of Dorset Horned sheep was secured in March as a foundation flock.

POULTRY

Good progress was made in poultry breeding, culminating in the production of many high-producing individuals. The vitality and weight of the stock has been held at a high standard. A gradual increase in egg production has attended the efforts to improve the flock by breeding. The 300-egg individual in a family of six full sisters that average 260 eggs per year has been attained. Costs in egg production, maintenance, fattening, incubation, brooding and rearing were obtained. Many pedigreed cockerels were sold to breeders. Cockerels were supplied to other Stations in the System. Provision was made for expansion in poultry breeding and experimentation. A heavy demand for stock and eggs existed throughout the year. Two laying houses and four colony houses were added to the plant. Oil and electric brooders were installed.

SESSIONAL PAPER NO. 16

BEEES

All colonies wintered well, reared brood early and were in fine shape for the honey flow. The apiary gave an average of 100 pounds surplus per colony, the heaviest in five years.

FIELD HUSBANDRY

Rotations.—Two-year—Oats, peas, vetch—clover. Three-year—Oats, sweet clover—beans. Four-year—Corn, wheat, clover—clover. Four-year—Oats, peas, vetch—wheat or oats—clover—clover. Clover seedings were injured by drought, spring crops were very short, autumn crops and hay were heavy. Sweet clover failed to start. All cultivated crops proved very expensive and in some cases unprofitable.

Cereals.—The autumn-sown cereals suffered from winter-killing. Yields were below the average. October seedings on well drained lands wintered much better than late seedings. On ill-drained areas the winter-killing was very heavy. The spring seeding was later than usual and followed by dry cool weather in May and June, gave very light yields.

Autumn wheat per acre average of three best varieties.. . . .	26.6 bushels.
Spring wheat per acre average of three best varieties.. . . .	17.4 "
Peas per acre average one best variety.. . . .	38.5 "
Oats per acre average of three best varieties.. . . .	33.4 "
Barley per acre average of three best varieties.. . . .	22.9 "

Heaviest yielding varieties under test in 1919 were:—

Autumn wheat.—Sun.

Spring wheat.—Marquis.

Peas.—Solo.

Oats.—O.A.C. 72.

Barley.—O.A.C. 21.

Five years' cereal work indicates that the following varieties are most satisfactory for the Island districts:—

Autumn wheats.—Sun, Golden Chaff, Bluestem.

Spring wheats.—Marquis, Bluestem.

Autumn oats.—Eclipse.

Spring oats.—Victory, O.A.C. 72, Banner, Garton.

Hulless oats.—Liberty.

Winter peas.—Solo, Arthur.

Spring peas.—Solo, Arthur.

Winter barley.—Tapp.

Spring barley.—O.A.C. 21, Manchurian, Success, Chevalier.

Hulless barley.—White Hulless, Blue Hulless.

Winter rye.—Thousand Fold, Dominion, Petkuser.

Vetches.—Common Vetch, Golden Tares, Pearl Vetch.

Cereal Breeding.—Head selection work was done with the various varieties and hybrids during the season, but no hybridizing was done, owing to pressure of other work.

FORAGE PLANTS.

Corn.—Ten varieties were under test for grain and silage production. All grew well and gave a good yield of green corn per acre. Very little grain was ripened. The following varieties are best suited to the district: Palisade, Northwestern Dent, Long fellow, King Phillip. The cost of production of corn was very high and this crop is not likely to be a very profitable one in the district. High labour cost and cool growing seasons have been very much against corn-growing in the Island district.

11 GEORGE V, A. 1921

Sunflowers.—The Russian sunflower was tested along with corn. The sunflower gave a larger total weight per acre, but this extra weight is largely water. The digestible dry matter content of the sunflower or the quality of the ensilage had not been determined at the close of the year.

Roots.—Thirty-seven varieties of mangels were under test. Varieties recommended: Giant Long Red, Danish Sludstrup, Yellow Globe. Thirty varieties of carrots were under test. Varieties recommended: Large White Belgian, Ontario Champion.

Sugar Beets.—Four varieties of sugar beets were under test, all were of the same character and gave identical yields. Ten tons per acre of rough roots is the average that the upland areas have produced in the past five years. The growing of the sugar beet for sugar is not a good prospect in the Island district, but the growing of sugar beet seed is a splendid commercial prospect.

Root Seed.—Mangel seed was produced under both autumn and spring setting of seed stock. Heavier yields were obtained from the autumn setting at a lower cost. Sugar beets were seeded under the "Seed where grown" method and gave a very heavy yield at a very low cost. The sugar beet has proved to be one of the best seed growing prospects of the district. Turnips were seeded under two methods and the cost of production found to be too high for a commercial undertaking. Another failure was experienced in the second attempt to grow mangel stecklings by sowing the seed during the summer period.

Alfalfa continues to do well and gave the usual three good crops during the season. The area was given one thorough cultivation with the spring tooth cultivator, immediately after the first crop had been taken off. This sufficed to keep it weed free for the year. Ontario Variegated alfalfa has proven to be the most useful variety for the Island district. A number of varieties and types are under test under the row method of culture. The alfalfa area was increased considerably during the season. Early May seeding has proven the best.

Variety tests for grasses, clovers and miscellaneous forage crops were maintained. Orchard grass, tall oat grass, red and alsike clover continue to be the most useful of the haymaking plants for the district.

HORTICULTURE

The orchards were under the clover mulch system during the year; this resulted in considerable improvement to the soil, but the trees and fruit did not develop as usual during the season, as there was not sufficient moisture for both a soil improvement crop and a fruit crop. The orchard area has been divided to suit a plan of soil improvement experiments. Two areas, one in apples and one in pears, are being left for the continuation of the clover mulch system instituted in 1918. Soil moisture and soil fertility are serious orchard problems in this district. The plant breeding operations were confined to the hybridization of pears, apples, cherries, filberts, strawberries and the caring for seedlings already produced.

Bush and cane fruits did well and excellent yields were obtained from strawberry varieties. Loganberry and currant varieties, cherries, quinces, medlars, plums and pears all gave excellent crops of very desirable fruit. Apples and peaches were small and of only fair quality. Nectarines and apricots produced but few fruits of poor quality.

Apples recommended: King, Grimes, Gravenstein, Wealthy, Melba.

Pears recommended: Bartlett, Bosc, Diel, Avranches, Crassane, Hardy, Fulvie, Belle Lucrative.

SESSIONAL PAPER No. 16

Cherries recommended: Olivet, Morello, Richmond, Montmorency, Neuvalle Royale, Bing, Lambert.

Plums recommended: Washington, Bradshaw, Peach, English Damson, Italian prune, Greengage.

Peaches recommended: Alexander, Triumph, Elberta, Crawford Early, Yellow St. John.

Nectarines recommended: Lord Napier.

Quinces recommended: Pineapple, Du Portugal, Bourgeault.

Grapes recommended: Lindley.

Vegetable seed production was one of the main features of the horticultural work for the year. Good results were obtained in the various classes. A total of 2,500 pounds of seed was produced, all of excellent quality and from high-class stock.

The development of the foreign economic plants, tea, eleagnus and persimmons was very satisfactory. The holly orchard was moved to a new and more suitable location. The cascara trees continued to do well under cultivation. The filbert orchard has developed well and has been extended by additional plantings of Station seedlings. The two filbert varieties, Fertile de Coutard and Nottingham, continue to head the list for productiveness. Walnuts, almonds and chestnuts made fair growth. The dry conditions existing during the period of growth of the nut tree varieties is much against the success of commercial nut culture. Trees planted on deep sandy soils are doing well. Grape varieties did not ripen satisfactorily, the Lindley being the only variety so far tested that is suitable for vineyard planting. Strawberry variety test work received considerable attention during the year. Many varieties new to the district have been secured and planted. The Magoon variety continues to be the best variety for commercial planting.

The borders and shrubberies planted in the landscape area made good growth during the year. The varieties and types are extensive, and are of great interest to visitors.

The nursery for horticultural and forest plants has been maintained. Considerable material was removed for planting during the winter and spring periods.

The flowering bulb experiments continued to attract much attention. Results in bulb growing have been satisfactory. Bloom production has been excellent.

The arboretum received due attention. Trees suited to local conditions grew well, while such species as are unable to withstand long summer drought have perished. The southeast end of the arboretum area was planted with seedling nut trees of filbert, chestnut and walnut varieties.

BUILDINGS

A residence for the use of Superintendent was built. An extension was built on the dairy barn. Two laying houses and four colony houses were added to the poultry plant. A small pump-house was erected on the horticultural grounds. General repairs and painting were carried out on the existing structures.

SOIL IMPROVEMENT

Many tons of rocks, stones and roots were teamed from the fields. Some tile draining was done.

ROAD IMPROVEMENT

Road grading and gravelling were practised on portions of the farm roads.

11 GEORGE V, A. 1921

EXHIBITIONS

An exhibit with an official in attendance was supplied to the Vancouver and New Westminster Fairs in September and October. A seed exhibit with an official in charge was supplied the Provincial Seed Fair, Kamloops, in January. An exhibit without an official was sent to the Cowichan Agricultural Society Fair at Duncan.

MEETINGS ATTENDED

The Superintendent attended and acted as judge at the following fairs and exhibitions: The Provincial Exhibition at New Westminster, the Seed Fair at Kamloops, the Flower Show at South Saanich, meetings of Farm Institutes, Woman's Institutes, Seed Growers, Dairymen and Greater Production Organizations were addressed at various times throughout the year.

VISITORS

Many large picnic parties visited the Station during the summer period. Many visitors from Western Canada and the United States visited the Station seeking information relative to island conditions. Many island people called for information during the year. The estimated aggregate of all visitors for the year is 3,855 people.

